THE AMERICAN GAS LIGHT JOURNAL

PUBLISHED WEEKLY, AT No. 42 PINE STREET.

VOLUME CI., No. 3. Whole No. 2,041. | NEW YORK, MONDAY, JULY 20, 1914. | Subscription, $3 Per Year. $4 Canada, $5 Foreign.

INDEX TO CONTENTS, PAGE 33 - - - - - - - - - ADVERTISERS' INDEX, PAGE 22.

Riter-Conley Manufacturing Company

STEEL CONSTRUCTION

Pittsburgh

LIBRARY OF CONGRESS
JUL 20 1914
SMITHSONIAN DEPOSIT

THE UNITED GAS IMPROVEMENT COMPANY,

PHILADELPHIA.

BUILDERS OF

THE STANDARD DOUBLE SUPERHEATER

LOWE WATER GAS APPARATUS.

ACCURATE MEASUREMENT

OF

AIR AND STEAM SUPPLY

(PATENTED),

AFFORDING { PERFECT CONTROL OF GENERATOR FIRE CONDITIONS.

PRODUCING { UNIFORM RESULTS. HIGHEST EFFICIENCIES.

THE AMERICAN
GAS LIGHT JOURNAL
INC.

VOL. CI., No. 3. NEW YORK, JULY 20, 1914. WHOLE No. 2,041.

CONTENTS.

An Asterisk (*) Denotes an Illustrated Article.

Industrial Fuel, by an Experienced Engineer 33
*Coal and its By-Products, by Louis C. Jones, Ph.D 35
*New Office Building of the Portland, Me., Gas Light Company... 38
OFFICIAL NOTICES—
Michigan Gas Association Meeting 40
Pacific Coast Gas Association 40
EDITORIALS—
Briefly Told 40
Missouri Commission Regulations — Philadelphia Section Gas "Meeters,"—Bronx Gas and Electric Company Employees' Associa- New England Section National Commercial Gas Association—Mutual Liability Insurance in New York.—Death af Mr. J. E. J. Mayer.
The Analysis and Classification of Illuminating Systems, from Report of the Research Committee, Illuminating Engineering Society. 42
*The "Dryco" Coke Cooling Systems 43
Gas Purification by Heat, from a lecture by Dr. Charles Carpenter, Chairman of the South Metropolitan Gas Company, London 44
NEW METHODS AND APPLIANCES 45
Liquid Air and Oxygen—Preservation of Wood—*High Pressure Expansion Joint.
Recent Patent Issues 40
ITEMS OF INTEREST FROM VARIOUS LOCALITIES 40
Another Jacksonville Reduction.—Boston's Large Gains.—Not Justiful in Extending.—Outing at Springfield, Mass.—Ypsilanti Municipal Proposition.—Harrisburg, Pa., may get Coke Oven Gas.—Gas Lighting Contract.—Oven Gas for Chattanooga, Tenn.—United Gas and Electric Acquires Plants.—Lehighton, Pa., Plant.—Waterville, Me.—Wont Heat the Park.—Reduction in Hoolbrook, Mass.—Incorporate Statesville, N. C., Company.—Atlanta, Ga., Petition.—A Virginia Outing.—Milwaukee Officers and Action.—Boone, Ia. Growth.—Doherty Operating Company.—Petition to Consolidate.—Personal and Other Items.
UTILITIES COMMISSION NEWS 48
Pacific Gas and Electric Plan Approved.—A Drastic Reduction.—Watching Brooklyn, N. Y. Case.—Extend Massachusetts Board's Authority.—Reduction Refused.
Financial Notes 48
Public Lighting Table for July, 1914.....(Advertising Section) 10
Meeting Times of the Various Gas Associations " 27

Industrial Fuel.

By an EXPERIENCED ENGINEER.

For a number of years artificial gas has been sold for industrial purposes, but the field has only been touched here and there. Some companies have developed the industrial fuel business along certain lines, some have had no bounds at all, while others have done little if anything. The rapid development by some of the companies in this field and the unlimited prospects which are presenting themselves have caused the numerous gas associations to do a great deal of work along these lines, and the subject is now being given especial attention by the National Commercial Gas Association. The main object of this article is to bring before the medium sized companies the great possibilities of industrial fuel, and some experiences in this field, and to suggest certain lines of operation which have been found successful. No town is so small, that there is not some possibilities to sell gas for industrial purposes. Every town, no matter how small, has its blacksmith shop; its general repair shop; its bicycle shop; its contractors, etc., in fact even the villages have posibilities unthought of to the average gasman. An analysis of years of experience in this field will be given in order to assist the smaller companies to awaken and see what possibilities really exist and what others have done.

What the future of the industrial gas field will be is unknown to us; where it will end is not known. There are companies who have limited their fields, and say that up to certain points city gas for industrial purposes has possibilities; but this age of improvements in burners, apparatus, appliances, methods, etc., makes the future absolutely without bounds, and the time is rapidly drawing near when there will be little if any coal or wood in its crude form used to generate power or heat for industrial purposes. Every day new possibilities present themselves, therefore the gasman and gas fraternity are in no position to predict where the industrial fuel field will end, or the possibilities of city and natural gas for industrial purposes.

To all gas companies the introduction of gas for industrial purposes has opened large fields which have brought increased sales; with plants worked to their full capacity or even enlarged, in order to take care of these extra consumers. Every cubic foot sold in this direction means a reduction in overhead and operating expenses, and this field ought to be given a great deal more attention than it has had in the past from the smaller gas plant. In order to do this the gas man must educate himself to fully realize the the importance of it. What would you do to double your output? Anything within reason will be your answer. Then the surest, quickest and best way is to develop your industrial fuel field. Make your prospects and work them, and the ultimate result will be, you can meet the continual increase in the price of raw materials, rate agitation, etc., and still be able to sell your gas at a price which at present is too low to be considered.

What has industrial gas done for other companies? There are some cities selling gas at a lower rate, getting better results, higher earnings, larger sales, just because they have gone into this field. Cities like New York, Chicago, Philadelphia, etc., are able to employ thoroughly experienced industrial fuel men, but the smaller ones cannot afford this, so the manager himself or one of his assistants must be educated in order to get this large industrial business which has been left untouched in most of the smaller cities. Numerous papers have been written upon industrial fuel conditions of the day, its development, etc., but practically all of them speak of conditions in the larger cities, and few if any tell how the smaller companies should proceed in order to enter this field; what precautions they should take; the best appliances to purchase; the best sales methods; the possibilities under their conditions; or giving them the benefit of past experiences in order that they may start right.

Let us first see what some smaller plants have done, in order to show what possibilities really come. In one small manufacturing town the gas company had a hard time to meet conditions, and a change of management was made. The new manager immediately saw big opportunity for industrial fuel gas, and not being in position to employ an experienced man, attended to it himself. He succeeded in increasing the sales of gas over 100 per cent. in two years, and with this additional load, the plant was worked nearer to its maximum capacity; the operators worked full time, because the apparatus was working full time; he reduced operating costs; he got full value out of all the works apparatus. He increased the sales per mile of main, per meter, per capita, and so down the line; and reduced general expenses per 1,000 cubic feet of gas sold. In fact, each ad-

ditional industrial consumer helped each department in turn, so that to-day his company is paying good dividends, they have an excellent standing in the community and people are willing to consider gas for most anything.

In another city of 11,000 inhabitants, not a manufacturing town, where the industrial business was worked by the manager personally, gas sales were increased 32 per cent. by the additional gas sold to automobile repair shops, butcher stores, repair shops, contractors, etc. The writer knows of many such places and could make a long list, but these two illustrations just show what some are doing and what can be done.

Is not one industrial consumer who will use 75,000 cubic feet a month, 12 months a year, as good as 50 domestic consumers who will use but 1,000 cubic feet per month? Of course we need them both, but why not consider the larger one. We have less trouble in collecting bills, a minimum amount of care and get satisfactory results. A bookkeeper can handle the industrial fuel accounts in a city with less trouble than a lot of domestic consumers using the same amount of gas in total. In one company, of which the writer is familiar, they added within a year 21 industrial consumers, which increased the sales 1,600,000 cubic feet per month without any additional expense, and without running new mains. This company has satisfied consumers; has the full confidence of the public and the city officials, and is showing excellent earnings upon the capital invested. The arguments for industrial fuel developments are endless, and the main thing is what to do and how to do it; and after you have your prospects developed, what type of appliance to use, how to install it, how to take care of it and the ultimate results. Then last, but not least, what arrangements to make in order to get your money.

In the first place the subject of organization must be considered. The large plants have experienced industrial fuel men drawing big salaries. Others have men with some experience, but who are not getting the results they ought to get. In the first place to get the best we must pay for it. It is impossible to get high class experienced men, for the salaries of ordinary solicitors, For the company with large factories and industrial fuel prospects the industrial men must be perfectly familiar with the details of the manufacture and distribution of gas, and have technical knowledge of the power of gas; what it really is, what its possibilities are and how to get full benefit of every heat unit in it. They should have some mechanical knowledge, especially along the lines of treating metals, etc., and must be thoroughly familiar with the local conditions. They should have full knowledge of all the different types of appliances on the market and know their possibilities. They should know which is the best and why, and should have a testing room, where they can experiment and find out which is the best, etc. They need a full set of catalogues, and a small mechanical and gas reference library. Then last, but not least, they should be of such personality that they can get an audience with the heads of the largest concerns and be able to hold their attention; and, in addition, get the good feeling, co-operation and assistance of the men who must operate the appliances. In other words, the real industrial fuel man must be a good "mixer," in every sense of the word. Many industrial fuel prospects have been ruined by not considering the man below and not having his co-operation.

The small gas company cannot employ a special man for this work, and it falls to the lot of the manager himself or one of his assistants. A manager who is about to go into this field should first read as many articles as possible on this subject. He should get catalogues from all industrial appliance manufacturers and determine which is the best. He should spend a day or more in some large city looking over industrial fuel installations and see exact operating conditions; and should spend some time at the industrial fuel appliance exhibits at the gas conventions. Appliance companies will take anyone around to see the different installations in their cities. In fact, such are worth more than all the book knowledge that can be bought. If the manager has too much to do, one of his brightest solicitors, or preferably a good fitter who has other qualifications, or is willing to learn, is best. A good way is to make a list of all the prospects in a town and then look up factories where they have gas installations similar. There is nothing like seeing an appliance in use; and then you can find out the results obtained and even get the advantages and disadvantages of their present appliance, etc. This is an education itself and the cheapest and best in the end. Do not install an apparatus just because the appliance manufacturer says it is what you need. Do not purchase an appliance just because it is the cheapest. The cheap forge may be easier to sell to your prospect, but in the end it may ruin your business forever. What you want is the best.

Let us say that you have thoroughly familiarized yourself with your local conditions, and have gone to some of the large cities and investigated installations of like character. You have also obtained a line of catalogues and literature and know what is in them. Remember catalogues were not gotten up to place on the shelf, but to bring you information and the results of experience. Understand every detail of the furnaces you want to sell. A sale is made a great deal quicker and sticks better, when you show a man that you know what you are talking about. You would not attempt to sell gas ranges without a sample or two on the floor; you cannot sell burners or fixtures or water heaters without having something to show your prospect to get his interest. Therefore, don't expect to interest a manufacturer in the use of gas for fuel if you have nothing to show him. I do not mean that you need have a duplicate appliance of what you expect to sell, but you need something to show industrial fuel uses. In the cities they have display rooms, sometimes an entire room to show appliances for industrial purposes. Some appliance companies sell what they call industrial display sets. For the medium sized company a display should include a fair size and a small forge and a bench forge, if you have a manufacturing town; if not, two forges are sufficient. There should be a full line of small blast and atmospheric burners, and a small bench melting furnace, with a crucible or two (the latter is a very small appliance and can easily be sold to dentists); a set of brazing burners is also a good thing; a few soldering iron heaters of blast and atmospheric type and if possible a small hardening and soft metal furnace. For the smaller plant, a small bench forge, a few blast and atmospheric burners, a small bench melting furnace and a soldering iron heater or two. These ought all to be connected with air and gas, so they are ready for use. If you have a fair display room a part of it can be used for industrial apparatus, but most companies prefer to have but a few burners on the main floor and the rest of the apparatus in the cellar or in a small room by itself, where they can show the prospect actual working conditions. Above all have them connected up, ready for use, and keep this department clean. Don't expect to get the full interest of the prospect if the appliances are rusty and dirty, as one of your talking points will be cleanliness. To these should be added a small gas engine to drive the blower. This set of appliances will put you in position to give a prospect a practical demonstration, and will get his interest. I know of one installation of 6,000,000 cubic feet per month gotten by interesting the proprietor of a large mill, by showing him a small melting furnace at work, and then explaining a like application for his processes.

Now as to window displays. Yow show in your windows gas ranges, water heaters, burners, mantles, arc lamps, etc. Then why not an industrial fuel appliance display once in awhile? Put a small display in your window and use a little gas; and see how quickly the public notices. A company I know never install an industrial appliance without first displaying in the window, connected up; and it is one of their best advertisements. You must get the layman to talk; to look and to see; and he will advertise you. An experiment was once tried by the writer by placing a small ribbon burner and a few small blast burners and one small brazing burner in a show window, lighting all burners after dark with no lights. The number of people that stopped to watch these burners would surprise anyone. Placing a small bench forge in operation in the window attracted a great deal of attention and was the means of selling three large forges. You must let the public see what you can do.

The writer once decorated a window, with a coke fired candy furnace in one corner, showing coke, ashes, dirt, and the uncleanliness of coke and coal as a fuel, with placards showing the amount of heat radiating from this type of stove, and the uncomfortable conditions that existed where coal or coke is used; while in the other corner was a gas fired candy furnace, and its advantages thoroughly exploited on placards, and then a cry for clean working conditions and sanitary factories. Within 4 months every candy company in town was using gas fired candy furnaces and had dispensed with coal and coke. They were not interested at first, but we created a demand by making the public take notice and getting them to advertise us. We made them understand conditions, and their efforts made it possible to interest the manufacturers. It is surprising what excellent and instructive window displays can be made with industrial fuel appliances.

As so few industrial fuel installations are identical, newspaper ad-

vertising is of very little value. In some of the large cities such advertising is admissable, but in smaller places it is valueless. Distributing literature and booklets does very little good, as few take time to read them. Very little advertising outside of window displays and demonstrating installations is of any value. It has been the writers experience that the best way to interest the industrial prospect is by personal visits. A satisfied industrial consumer is the best advertisement you can have. He will do you more good than all the literature in the world. A letter from him, to show the other fellow, or a word from him to the other, is worth more than anything else. That is why you should satisfy one at a time, and the rest will come without much trouble. Then do not forget when you take a booth at a fair, bazaar, or pure food show, that there is nothing that will attract the people like an industrial fuel display. It arouses curiosity and that is what you want. It gets them to talking and they will advertise you.

(To be Concluded.)

Coal and its By-Products.[1]

By Louis Cleveland Jones. Ph.D.

There have been listed and described perhaps several hundred thousand organic compounds, practically all of which can be obtained directly or indirectly from the decomposition of coal by heat. Carbon, oxygen, hydrogen, nitrogen, sulphur, phosphorous, and the halogens are normal constituents of ordinary coal, so that all compounds containing any of these substances, in any proportion, are possible by-products of coal. Coal also at times contains unusual constituents such as the rare elements in the ash, even gold and radium. We have known a coal ash to contain so much gold that the possibility was considered of treating it, after burning, as a gold ore. There are seams of coal in southern Indiana and eastern Kentucky which contain iron ore. The ash of some coal in eastern Pennsylvania and eastern Kentucky makes an excellent high-grade refractory fireclay. One of the principal coal seams in Illinois consists of an upper bench of limestone. But the true by-products of coal are the organic products, and they are so numerous that it would weary you to mention even all their group names. Acid bases, alkaloids, alcohols, gums, varnishes, solvents, sugars, saccharine, and stuffs as bitter as saccharine is sweet; disinfectants, dye stuffs, stimulating or sleep-producing drugs, healing medicines and violent poisons, vile odors and pleasing perfumes, are all by-products from the carbonization of coal.

In order more clearly to understand what coal is, we must look into its origin. In the early atmosphere of the earth, after the primordial substance had been transmuted into some eighty present well-known elements, and these were still in the condition of vapor uncondensed, there were present, fortunately, sufficient oxygen to combine with all the other elements which cared to associate with it, and just a little more. These vapors cooled and condensed to a molten mass in the form of a sphere—our earth.

The earth, cooled to the condition of a fairly homogeneous fused mass of rocks, may be compared with a tank of fluid melted glass, composed of impure mixed silicates with an excess of silica, about 75 per cent. of the total weight of the earth's crust, while the mixture in an ordinary glass furnace contains also about the same percentage (70 to 75 per cent.) of silica. Above this fused mass was an atmosphere containing the present amount of air (nitrogen and oxygen), and also as steam all the water now condensed in the ocean, and all the carbon dioxide now fixed in the form of limestone (calcium carbonate). There was also present, of course, in that atmosphere relatively small amounts of sulphur and halogens, since deposited as salts. On this basis, then, we can readily calculate that, with all the water as vapor, and all the carbon dioxide as gas in the atmosphere, the pressure upon the earth's surface would be enormous, *i. e.:*

± 300 atmospheres water vapor.
200 atmospheres carbon dioxide.
1 atmosphere nitrogen and oxygen.

Thus the earth's atmosphere was composed, by volume, of

	Per cent.
Steam	79.2
Carbon dioxide gas	20.4
Air (oxygen and nitrogen)	.35

1. Journal of the Franklin Institute. Slightly abridged.

all under a pressure of say 500 atmospheres or 7350 pounds per-square inch. Under these conditions cooling was rapid, due to the continuous condensation of water vapor high in the atmosphere, and its high re-evaporation lower down. When the earth's crust became sufficiently cool the solid granite masses, thrust up by contraction, were violently attacked by this superheated steam and carbon dioxide under tremendous pressure. Decomposition of the granite was rapid, with formation of shales (aluminum silicates) and bases (alkalies and alkaline earths) from feldspars, and sandstones (silica) from quartz. Cooling continued below the boiling-point of water so that most of the water condensed, leaving a moist atmosphere containing over 98 per cent. of CO_2, and less than 2 per cent. of nitrogen and oxygen together. In these warm waters shales and sandstones were sedimented, and at the same time lime from the decomposed granites was carbonated or bicarbonated and deposited to form the enormous limestone beds of the geologic ages preceding the coal-forming era. Since our limestone deposits are generally sedimentary it is evident that much water had condensed before the great bulk of carbon dioxide was taken from the air by the decomposing granites. At any rate, in this manner, at the same time water was condensed, or subsequently, the formation of limestone (possibly, as Dana says, by means of animal or vegetable organisms), with absorption of carbon dioxide, continued until, with decreased temperature and decreased amounts of carbon dioxide in the air, plant and animal life became possible. Experiments indicate that plants of our time will not thrive in an athmosphere containing more than 10 per cent. of carbon dioxide, but that they do benefit considrably by percentages higher than normally present in our air.

Certainly in the carboniferous era plant life flourished as never before or since, due to a warm, moist climate, and probably also to high atmospheric pressure, and particularly in the presence of a moderately high percentage of carbon dioxide. Possibly the highly carbonated earth waters, as recent experiments suggest, stimulated a luxuriant growth of vegetation. It is quite probable that the atmosphere of the coal-forming era contained from 2 to 5 per cent. of carbon dioxide, while at present we have but .03 of one per cent. Furthermore, this carbon dioxide and high moisture content of the air doubtless brought about a more uniform distribution of heat, so that tropic vegetation flourished from the equator to the poles. In addition to the absorption of carbon dioxide during and since carboniferous times to form limestones, the great coal deposits of the earth have taken their carbon equivalent from the carbon dioxide of the atmosphere.

A committee of the XII International Geological Congress, held in Canada last fall, determined the total mineable coal deposits of the world to be at most 7,400 billion tons. Double this, or 14,800 billion tons, may be taken to safely represent all other coal in thin seams beneath the ocean and in other ways not mineable.

Now, if we compare our total coal deposits, 15,000 billion tons (calculated into its equivalent of carbon) with the .03 per cent. of carbon dioxide still in our atmosphere (equivalent to 700 billion tons of carbon), we get the striking information that the coal deposits of the world required and took from the air 11,000 billion tons of carbon for their production, and there are left in the air to-day but 700 billion tons of carbon, or but 6 per cent. of the total originally required to produce the coal we have. In other words, no more coal could have been deposited because the raw material was practically used up. This world cannot, therefore, have another carboniferous era until we burn up our present deposits, and when we do get them burned up there will be say .6 per cent. more CO_2 in the atmosphere, and the same amount less of oxygen than at present.

It would not be unreasonable to estimate that the ordinary growth of vegetation and forestry may consume 400 grams of carbon dioxide per square meter of surface per year, or 100 grams per square meter over the entire surface of the earth, or about 2 per cent. of the 4,400 grams of CO_2 in our present atmosphere. The production of carbon dioxide by the 1,200 million tons coal annually consumed is but one-seven-hundreth part of the carbon dioxide already in the air. At any rate the present increase or decrease of the carbon dioxide in the air is not perceptible by present means of analysis. Any further decomposition of granities, though now slow, due to the comparative small amount of the rock exposed, must absorb a corresponding amount of carbon dioxide from the air, and when the minutest amount more has been absorbed, compared with what has already been accomplished by such decomposed granite, no more carbon dioxide will remain to sustain plant life and the earth will become a

dead world. But granites, besides being protected (covered up) from weathering, are also decomposing more slowly because of the comparatively low temperature and low pressure of the atmosphere acting upon them.

The following table gives the coal resources of the world, and on this basis it will not be difficult to predict great commercial growth in such nations as China, when she has had a generation of technical education:

Coal Resources of the Nations of the World. (*In million tons.*)

Nation.	Anthracite.	Bituminous.	Sub-bituminous.	Total.
United States	19,684	1,955,521	1,863,452	3,838,657
North America (except United States)	2,158	284,162	948,454	1,234.774
China	387,464	607,523	600	995,587
Germany		409,975	13,381	423,356
Asia (except China)	20,173	152,575	111,251	283,999
Great Britain and Ireland	11,357	178,176		189.533
Oceana	659	133,481	36,270	170,410
Evrope (except Germany, France and Great Britain and Ireland	39,718	92,331	21,669	153,718
Africa	11,662	45,123	1,054	87,839
South America	700	31,397		32,097
Total	496,816	3,902,944	2,997,763	7,397,553

From the following table, showing the annual coal production of the principal countries of the world, and the table calculated from it, showing the percentage increase in production by 5-year periods, we are able to predict with some degree of certainty a comparatively early exhaustion of the coal resources of the world. Incomplete data for the years succeeding 1910 show no falling off in production; in fact it is already evident that the normal 5-year increase will be exceeded by 1915.

Annual Coal Production of Principle Countries of the World. (*In million tons.*)

Country.	1855.	1870.	1875.	1880.	1885.	1890.	1895.	1900.	905.	1910.
Australia							4.01	6.48	6 83	10.00
New Zealand							0.76	1.11	1.41	2 23
China										14 59
India							2.65	6.22	7.92	12.09
Japan							4.84	7.43	11.89	14.70
South Africa							1.40	0.76	3.22	5.50
Canada							3.19	5.09	r.96	13.00
United States	24.79	29.95	48.20	66.83	102.18	141.62	177.59	243.41	351.12	445.81
Mexico										2.45
Great Britain	90.76	112.24	135.49	149.38	161.97	184.59	194.35	228 77	239 89	264.51
Spain	0.45	0.66	0.61	0.85	0.94	1.18	1.77	2.58	3.20	3.55
France	11.84	13 30	16.95	19.36	19.51	26 08	28.25	33.40	36.05	38.57
Belgium	11 84	13.69	15 01	16.,8	17.44	20.37	20.41	23.46	21 84	23.13
Germany	28 33	34.88	48.54	59.12	73.67	89.29	103.96	149.79	173 66	221.98
Austro-Hungari	2 02	8.36	13.06	14.80	20.43	26.10	27.25	39.03	40.72	38.00
Italy							0.25	0.48	0.31	0.40
Sweden							0.20	0.25	0.33	0.21
Russia	0.33	0.69	1.17	3.27	4 24	7.00	9.10	14.76	17.12	24.57
Other countries	2.71	4.04	6.26	9.28	12.45	16.80	1.75	2.90	4.55	8.00
Total	182.08	217.81	285 30	339.37	412.82	513.12	581.72	765.92	928.02	1,143.38

Increase in Coal Production by Five-Year Periods. Percentage Increase Over Previous Period.

	1855 to 1870	1870 to 1875	1875 to 1880	1880 to 1885	1885 to 1890	1890 to 1895	1895 to 1900	1900 to 1905	1905 to 1910	Average.
United States	21	61	38.5	53.0	38.0	26.0	37.0	44.0	27.0	38.4
World	19	14	19.0	21.5	24.3	13.3	31.6	21.3	23.3	20.8

On this basis the world's resources will last 250 years, while the United States at her higher increase in production would exhaust her supply in 110 years.

Now we have 7,400 billion tons mineable coal, but of greatly different varieties. And though capable of producing an enormous number of by-products, the substance of the different coals is not so mysterious if we remember that each variety of coal represents only a different step in nature's slow process of converting the vegetation of the carboniferous era into the fuels so necessary to our modern civilization. Essentially coal was originally wood (cellulose $(C_6H_{10}O_5)_n$ and resins, now converted in the age long processes of nature into peat, lignite, semi-bituminous bituminous, gas coal, smokeless coal, semi-anthracite, anthracite, graphite, diamond, and we might also place carbon dioxide, the raw material from which the wood is made, at the head of the series. It is thus quite remarkable that our fuel coals, near the end of the series, upon burning return again to the air as carbon dioxide, to be converted by photo-chemical processes a second time into vegetation (wood), and thus repeat the cycle of the carboniferous age. So here when we seek the origin of graphite which is found in the granites of the archaic ages, we can only answer, a previous carboniferous era. We may estimate that over 70 per cent. of the weight of wood is lost in being converted to coal, and, according to tests given below, possibly one-half of this loss was carbon dioxide and the other half combustible gas and oils. This oil and gas, nature's by products, stored beneath folds of rock strata, constitute our present sources of petroleum and natural gas.

Since commercial carbonizing of coal gives the benzine series of products, and not paraffines as existing in petroleum and natural gas, efforts have been made to explain the origin of natural gas and petroleum from animal remains. We believe, however, that the slow distillation of coal at low temperatures is a more logical explanation. Industrial experiments recently carried on in England upon low temperature distillation by the Coalite process, and more recently on coking coals at even lower temperatures, and *in vacuo*, indicate that petroleum products identical with those found in nature are thus obtained. In duplicating nature's conversion of bituminous coals to anthracite, the modern by-product oven, operating at a temperature of 1,000° C. or more, does the work of ages in a day, producing coke the equivalent of natural anthracite, and, in place of natural gas and petroleum, illuminating gas and oils of the benzine series. In the electric furnace we convert coke into graphite and Moissan has converted graphite dissolved in cast iron into the diamond, the end of the series. But at these high temperatures the by-products are largely of the benzine series, while nature's by-products are of the methane series.

Recently, therefore, in our laboratory at Syracuse, we tried to determine the nature of the products at low temperatures, starting with the wood and going through the series to coke, and some of the re

	Wood.	Brown Lignite.	Black Lignite.	Illinois Coal.	Kanawha Gas.	Smokeless.	Anthracite.
Analyses (%):							
H_2O and volatile	75	70.5	65.6	42 0	29.0	20.0	7.9
Fixed carbon	25	29.5	35.0	58.0	71.0	80.0	92.1
Temp. decomposi- (° C.)	150	230	260	300	330	330	340
Temp. range of expts (° C.)	150–188	230–320	260–340	300–330	300–360	330–400	230–475
Litres gas evolved from 500 gms.	43.5	10.8	14.0	11.5	14.0	9.3	4.6
Cu. ft. gas, ton	3,080	750	1,000	815	1,000	659	326
Gas analysis (%):							
CO_2	58.6	55.6	49.3	24.1	7.3	6.5	10.3
C_6H_6	.5	.6	.9	2.8	.5	2.6	1.3
C_2H_4	.6	1.0	.8	2.2	1.4	2.3	.4
CO	35.0	24.7	19.5	10.6	6.0	4.1	2.6
CH_4	1.3	11.4	19.5	43 3	57.4	53 5	70.6
H_2	1.0	.3	.0	3.4	14 6	9.7	.0
N_2	3.0	6.4	10.0	13.6	12.8	21.3	14.8
Per ct. by weight volatilized	51.9	26.8	31.0	23.7	12.2	10.0	.7
Analysis of residue:							
Volatile	56.0	39.0	30.8	23.3	18.7	13.9	7.1
Fixed carbon	44.0	61.0	69.2	76.7	81.3	86.1	92.9

sults are tabulated below. They were gradually heated until decomposition started and a small part of the gas was driven off. The results are calculated to the pure, dry coal basis. In these experiments we used a cast iron bomb, heated electrically or in a muffle furnace.

The residue from the first carbonizing test on the brown lignite was again heated from 450 to 500° C., producing 3,500 cubic feet per ton of gas of analysis shown under heading "A." This second residue, heated again to 920° C., gave 7,000 cubic feet of gas "B."

	"A."	"B."
CO_2	27.2 per cent.	7.0 per cent
C_2H_4	5.5 "	1.2 "
C_2H_2	3.2 "	1.1 "
O_2	0.7 "	0.5 "
CO	9.2 "	22.5 "
CH_4	38.4 "	18.3 "
H_2	12.0 "	41.8 "
N_2	3.8 "	7.5 "

Evidently, from these tests, decomposition gradually brought about by heat tends to drive off at first the high oxygen content, and each coal type is converted into a type similar to though not exactly like the succeeding higher grade fuel. In the case of wood, the gas first evolved contains about 97 per cent. of CO_2 and CO. Similarly the lignites and Illinois coals first gave off a high percentage of oxygenated compounds, and in this way necessarily the residues contain less oxygen and are of higher calorific value. Under high pressure doubtless a sharper fractional decomposition would result, and the residues even more closely resemble the natural fuels. At any rate, such slow, artificial carbonization is strikingly suggestive of nature's process. These residues show decided resemblances to the natural product. That they are not identical, both physical and chemically, may be due to the high pressure used in nature which we have made no effort to duplicate.

But if natural gas, chiefly methane and hydrogen, is a by product of nature's carbonizing processes, we must explain the disappearance of the large amount of carbon dioxide and carbon monoxide which was originally present in such decomposition gases. May we not assume that the CO_2 has been absorbed from the gas by the alkaline earth waters produced by weathering rocks, and that the carbon monoxide has been absorbed and oxidized by metallic oxides? Gas thus obtained from carbonizing lignite, for example, by removal of CO_2 and CO would be practically identical with natural gas. Thus, calculating out the CO_2 and CO from the gas obtained in heating lignites at low temperatures, we have left a gas containing principally methane, *i. e.*, a typical natural gas.

Now that we understand the nature of coals as different residues in the progressive decomposition of wood into graphite, we are in a position to classify them. Rejecting accidental impurities, such as ash and sulphur, and using the pure coal basis, coals may be classified in several ways. Five important differences are suggested on the following chart as bases of classification; for example, moisture, volatile, oxygen content, calorific value, and finally initial decomposition temperature. Specific gravity, total carbon, oxygen content, and other characteristics might also be given, all of which indicate the same progressive change in characteristics.

Unfortunately it is necessary to call attention to the lack of uniformity in methods of determining moisture and volatile matter in coals, since much of the data given in the tables presented depends in particular upon consistent results in the determination of these figures.

A coal in a moist atmosphere will, like any other hygroscopic material, take up and hold a definite amount of moisture, according to its position among the types of fuels shown on Chart I.

I am not aware that the decomposition temperatures of coal types have before been studied, but since coals are residues representing the different steps in natures's carbonizing process under progressively severer conditions, it is only natural that they should have different, and, as we go up the scale, increasing temperatures at which they begin (again) to decompose. That these decomposition temperatures are progressively higher is a further strong indication that coals really are just such residues as has been assumed. Low grade coals contain much moisture. They are in fact hygroscopic, and will, like other hygroscopic materials, when dried, take up again moisture from moist air in proportion to its relative humidity. As has sometimes been assumed, high volatile coals are not geologically new coals, nor are smokeless coals of an older geological formation, as is evident from the wide variations in volatile found in coals from

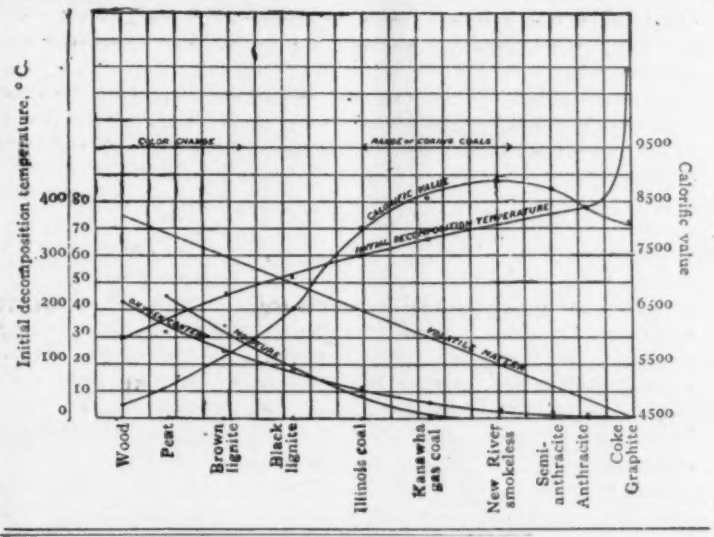


Chart I.

the same geological seam. For example, the Pocahontas coals vary in volatile from 16 per cent. in the true Pocahontus district, to above 30 per cent in the equivalent geological New River district. Though coals were formed from vegetation at the beginning of the carboniferous era, in the presence of more carbon dioxide in the air than later coals, this does not seem to have been the cause of any real difference in their character. The classification on the basis of temperature required to decompose is rational, as is strikingly shown from a study of coal deposits everywhere. In Washington State there are coals of all types from lignite to graphite, and, under different conditions, all types may be found in what appears to be the same geological horizon. When the seam is horizontal the coal is lignite; when somewhat disturbed and oblique the coal is generally a gas or smokeless coking coal; when folded it becomes anthracite, and finely when pierced by igneous rock, we have graphite.

In commercial work for our purposes coking coals have also to be classified as to cokability. Based upon oxygen content, though not requiring the tedious ultimate analysis, we have classified coals as to a cokability, using as a basis the calorific value of the volatile matter contained. This, for coals of the same percentage volatile content, fairly represents cokability in actual coke oven practice.

On Chart I the range of possible coking coals was indicated. Now, by deducting the calorific value due to fixed carbon (calculated) from the total calorfic value, and dividing by the amount of volatile matter, all on the pure basis, we get a series of coals of increasing cementing or coking tendencies.

As shown on Chart II, this variation in colorfic value of the

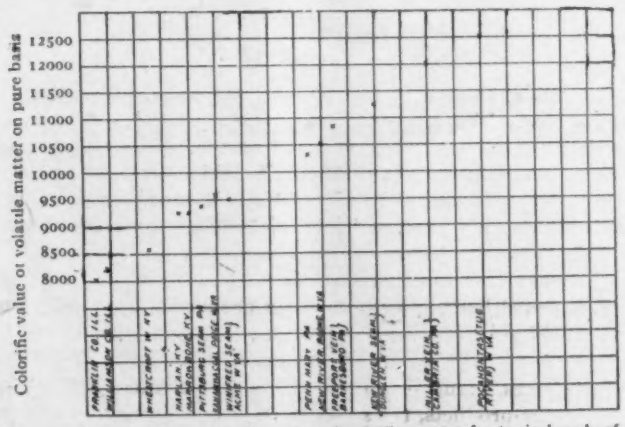


Table showing calorific value of volatile matter for typical coals of the United States.

Chart II.

volatile matter has been found to represent results in actual coking practice.

As the calorific value of the volatile matter increases the cokability increases up to the point where the actual amount of volatile matter becomes insufficient to cement and hold the mass together. For example, semi-anthracite coals and anthracite, as to cokability,

are beyond the limiting factor of insufficient cementing volatile material. Cannel coal is unusal in that the calorific value of its volatile matter is higher than for any other coal with volatile so high. By the Ralston method of classifying and plotting it falls well above the usual curve. Coals also differ as to the amount of materials contained capable of solution in caustic, pyridine, benzene and other solvents, and may be classified accordingly. So the residues from artificial carbonization at low temperatures give different amounts of matter soluble in the various solvents Finally, on exposure to moist atmosphere, coals decay. They become oxidized and go back in the series. For example, by taking up oxygen and water a good coking coal takes on the character of a poor subbituminous coal or the non coking lignite. Coals, and their by-products, are therefore not such mysterious materials. They are merely intermediate bodies resulting from the decomposition of ancient vegetation, just as a multitude of substances may be obtained by violent or gradual decomposition with heat of any simple organic compound.

The conversion of bituminuous coking coal to its anthracite-graphite equivalent, coke, has become of extraordinary commercial importance, and particularly when this is done with the recovery of the by-products. A ton of average coking coal will produce in the modern by-product oven:

1,500 pounds coke.
18 to 26 pounds sulphate of ammonia.
6 to 10 gallons tar.
1½ to 2½ gallons mixed light oils (benzole, toluole, xylole).
1½ pounds ferrocyanid.

By further elaboration, from these light oils and tar practically all the compounds mentioned in Beilstein may be produced.

On Chart III. is indicated the influence of temperature upon the

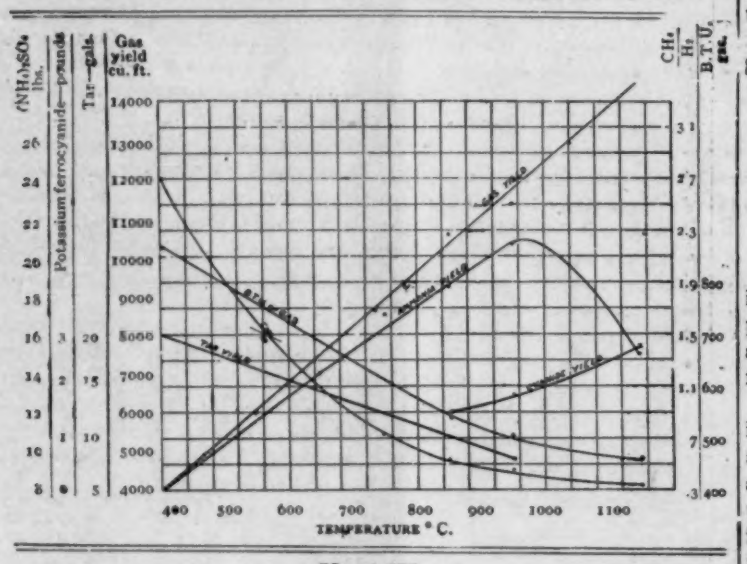


Chart III.

yields and character of the by-products obtained from an average coking coal. The temperatures given represents the hottest part of the retort at the beginning and end of the carbonizing period. The average temperature would be considerably lower.

On this chart the yield of light oil is not given, but our experiments indicate a maximum yield of this material at about 500° to 550° C.

Special Train Service for San Francisco and the International Gas Congress.

For the accommodation of those expecting to attend the International Gas Congress in San Francisco, September, 1915, the Transportation Committee have arranged for special trains from New York and Chicago. These trains will be the handsomest possible to assemble and will include baggage car, buffet-club car, standard drawing room and compartment sleepers, dining car and observation lounge car; all electric lighted and with electric fans in each car, compartment and drawing room.

Special attention has been given to the routing of the trains so that those taking them will enjoy the maximum of scenery and travel comfort in a minimum of time. The route will be via the Pennsylvania lines to Chicago, Burlington route from Chicago to Denver; Denver and Rio Grande Railway to Salt Lake City; and Western Pacific Railway to San Francisco. The schedule has been so arranged that the trains will pass through the scenic points of interest and the heart of the Rockies in daylight; and arrangements for stop-overs at interesting points enroute will make possible delightful breaks in the trip and avoid the possibility of weariness usually associated with a protracted journey. The scenery along the route selected includes some of the most noted natural wonders of the world.

The passengers on these trains will be limited to the number that can be nicely accommodated. Both trains will be under the escort of experienced railroad representatives, who will accompany them over the entire trip from New York to San Francisco. These representatives relieve passengers of the nuisance connected with tickets, baggage and all other travel details; and they will call attention to and explain all points of interest along the way. Special baggage checks will be prepared and passengers may have access to their baggage in the baggage car enroute if desired. An the journey's end the passengers and their baggage will be transferred from the station to their respective hotels, and nothing will be left undone to make this one of the most successful trips ever undertaken by the gas organizations.

Tickets will permit of returning via any other direct route and those who desire to return by way of Portland and Seattle, thence via the Great Northern or Northern Pacific Railways, or through the Canadian Rockies, may do so on the additional payment of $17.50 at the time of purchase of their tickets. No rates have yet been made by the Trans-Continental Lines via the Panama Canal. Anyone contemplating return via canal will have to buy one-way ticket to San Francisco and make independent arrangements for their return. Such a routing will carry a special rate other than the special round-trip rate made on account of the Exposition.

The following are the approximate railroad fares for round trip to San Francisco from the points designated, direct routing:

Boston	$106.00
New York City	100.00
Philadelphia	100.00
Washington	95.00
Baltimore	95.00
Chicago	62.50

Sleeping car fares from New York to San Francisco will be approximately $18.00 for lower berth, $14.40 for upper berth, $50.50 for compartment and $64.00 for drawing room. From Chicago they will be approximately $13.00 for lower berth, $10.40 for upper berth, $36.40 for compartment and $46.00 for drawing room.

In due time the Transportation Committee will issue a booklet giving full details in regard to the leaving time of the special trains, schedules, points of stop-overs, rates, etc., in which will be included a postal card for the making of reservations; and the Committee urge, in order to facilitate matters, that those who contemplate making the trip should make their sleeping car reservations promptly upon receipt of the announcement in order to assist the Transportation Committee in completing the details with the railroad companies interested.

New Office Building of the Portland, Me., Gas Light Company.

The new building of the Portland (Me.) Gas Light Company on Temple street, is a notable addition to that city's business structures. It is significant not only of the rapid growth of the Company, whose offices it will house, but of a broad-minded, far-sighted spirit, which takes into account the comfort of the public, the welfare of employees and the beauty of the city. In the completeness of facilities for all services of a gas company, this building stands without a superior in any American city of like size.

The main entrance is on Temple street, through an ample vestibule leading directly into the main display room. This is approximately 14 feet by 40 feet, unobstructed by columns or posts. Its ceiling is beamed and paneled and overhead are the larger types of "Equalite" lighting fixtures, which illuminate the room as well as the display. The floor of the room is laid in Terrazza panels, with borders of white and gray Knoxville marble. To the left of the main display room is the demonstration room, to be used for lectures and demonstrations of useful gas appliances especially interesting to housekeep-

Fig. 1.

Fig. 2.—Display Room on First Floor.

ers. In the corresponding space on the right are shown such articles as hot water heaters, and special kinds of ranges, all displayed under actual service conditions, and so placed that they may be seen and studied in operation.

Fig. 3.—Fixture Display, Second Floor.

Toward the rear and facing the main room are the counters of the cashiers, the order desk and the offices of the service manager and manager of the appliance department. All these are readily accessible and the purpose of the company is to make their services as prompt and convenient for the public as possible. On this floor are also the offices of the president, vice-president and treasurer and the large counting room with an ample vault for storing records.

From the first floor, wide stairways lead to a well-lighted display room in the basement and to a large fixture display room on the second floor at the front of the building. In the basement are displayed the numerous heavy appliances for which space cannot be given on the first floor. The second floor display room will be especially attractive because of its exhibition of tasteful and artistic fixtures. Opening from this apartment is a well-appointed rest room for women, and the remainder of the space toward the rear of the building is devoted to general clerical offices, with a storage vault similar to that on the first floor.

A large portion of the third floor is set apart for the comfort and social welfare of the company's employees. They are afforded here the comforts and conveniences of a well-equipped club. There is a quiet library containing books and all the current publications relating to the gas business. There are well-arranged toilet rooms and a gas kitchen in which supper may be prepared for special occasions. All these features are in line with the modern, progressive idea that increased efficiency and consequent value of employees to the company are gained by everything that will tend to promote the comfort and general welfare of the working force.

Provisions for heating and ventilating the building have been given very careful and painstaking attention. A system of ducts has been provided to carry off the heated air and keep the display rooms and offices comfortable. Fresh air is poured into the rooms through another system of ducts after it has been screened to free it from dust and heated by steam coils to the desired temperature. The movement of air is by motor-driven fans located in chambers in the basement.

The Portland Gas Light Company was incorporated in 1849, and organized in 1850, and has had unvarying success. For over 46 years of the time Edward H. Davis was president of the company, making a term of service scarcely approached in length and usefulness by anyone of this generation.

Both in quantity, quality and price of its output the company has kept pace and compares favorably with gas companies in other cities of equal or even greater population than Portland. The following comparisons give a good idea of its continued progress:

	Price.	Number Consumers.	Used.
1864....	$3.80	1,859	21,109,000 cubic feet
1875....	3.00	3,014	51,429,000 "
1885....	2.25	2,724	52,718,000 "
1894....	1.80	3,115	55,836,000 "
1909....	1.25	8,662	165,091,000 "
1910 ...	1.15	9,333	176,514,500 "
1913....	1.00	11,500	259,000,000 "

The extent to which gas is used in Portland for other than illuminating purposes can be judged by the following list of appliances in use:

Over 9,000 ranges and cookers.
Over 4,600 heaters and radiators.
Over 1,000 water heaters.
Over 5,000 gas irons, hot plates, griddles, etc.

The company employs, on an average, 125 men, its roster to-day, and at times nearly 200. Its payroll amounts to more than $100,000 yearly. Its output of gas this year will total nearly 275,000,000 cubic feet, and the prospect for the coming year is for a still larger product.

The officers of the company are: President, F. N. Dow; Vice-President, W. H. Moulton; Treasurer, Burton Smart; Superintendent and Engineer, H. Burgi.

Mr. Louis N. Rancke has opened an office as consulting engineer at 45 Knickerbocker Street, Baltimore, Md. Mr. Rancke has had 16 years experience in designing, erecting and operation of coal gas benches and the manufacture of refractories; and is competant to handle heating problems of all descriptions.

THE AMERICAN GAS LIGHT JOURNAL INC.

Entered at the Post Office, New York City, as Second-Class Matter.

Published weekly at 42 Pine Street, New York City.

Telephone Call, John, 2996. Cable, Am-Gas.

E. P. CALLENDER, President.
A. M. CALLENDER, Vice-President and Treasurer.
CHARLES H. WADELTON, Secretary and Manager.

SANFORD K. CAMPBELL, Editor.

Agents—American News Co., 11 Park Place, New York City.
Lemcke & Buechner, Berlin, Germany.
Aug. Siegle, 30 Lime Street, London, England.

TERMS OF SUBSCRIPTION.

United States, Cuba and Mexico, $3 per year. Canada, $4 per year. All other countries, $5 per year.
Single Copies, 10 Cents.

NOTICE TO ADVERTISERS.

New Advertisements and changes of copy therefor should be in hand Wednesday noon of week prior to date of issue.

NEW YORK, MONDAY, JULY 20, 1914.

[Official Notice.]

Michigan Gas Association Meeting.

Office of the Secretary-Treasurer,
Grand Rapids, Mich., June 29, 1914.

The annual meeting of the Michigan Gas Association will be held at Lake Harbor, Wednesday, Thursday and Friday, September 2, 3 and 4. This decision has just been made by the Executive Committee of the Association and we are sure those attending the meeting will find this departure from the regular practice of holding gas association meetings in the large cities, a most delightful experience.

Lake Harbor is a resort beautifully located on Lake Michigan and an inland lake 4 miles south of Muskegon, Mich. It is reached by Goodrich Boat Line via Muskegon, and by the Grand Rapids and Indiana Railway, and the Grand Rapids-Muskegon Electric Road via Grand Rapids. The hotel accommodates 500 guests, is prettily located and gives excellent service. There is a fine 18 hole golf course, baseball grounds, 9 tennis courts, Lake Michigan bathing beach, fine bath houses, bowling alley, billiards, canoeing and good automobile roads. There is a combination theater and convention hall which may be used for dancing parties as well as for the business sessions of the convention.

There are a number of cottages in connection with the hotel, and it is hoped that members will bring their wives and children, for the resort specially caters to the whole family.

At the time chosen, the association will have the resort practically to itself, and there is enough to do aside from a carefully planned business programme, which will be announced later, to make the trip worth while to any gas man within reachable distance of Michigan. Every gas man is invited to meet with us whether a member of the association or not. The hotel rates are on the American plan ranging from $3 a day without bath, to $4 and $5 a day with bath; and will for this occasion cover the use of the golf course, tennis courts and other features for which there is usually an additional charge.

Glenn R. Chamberlain, Secy. Treas.

[Official Notice.]

Pacific Coast Gas Association.

Office of the Secretary,
445 Sutter Street,
San Francisco, Cal., June 25, 1914.

To the members of the Pacific Coast Gas Association: As the date of our 22nd Annual convention is rapidly approaching, this is to advise that our President, Mr. Champ S. Vance, of Los Angeles, Cal., is leaving no stone unturned to make the Convention a success in every particular.

The papers which are being prepared for presentation before this meeting will all be strictly up-to-the-minute. Our wrinkle editor, Mr. H. W. Burkhart, promises to eclipse all previous efforts so far as his department is concerned, and our experienced editor, Mr. John Clements, will relate to you many strange things experienced during the past year. The Gas Exhibit Committee promises an exhibit equal to if not surpassing all previous efforts, and in addition to this they are preparing a composite paper for presentation, which will be a masterpiece so far as the uses of our commodity are concerned. Our Vice-President, Mr. E. C. Jones, will be prepared to present a full report covering the International Gas Congress, to be held in San Francisco, 1915, to which Congress our Association is to be host.

The total membership of our Association, as constituted to-day, is 378, and in view of the fact that the International Gas Congress is an assured fact, this should be an incentive for all persons engaged in our profession, who have not already affiliated with the Pacific Coast Gas Association, to do so now, in order that they may participate in the activities of the International Gas Congress in 1915. This is to ask that each and every member of the Association constitute himself a membership committee of one to point out to his co-workers the many advantages to be gained by being affiliated with our Association. Point out to the likely ones the character of papers that are presented before our conventions, and the advantages of being present and taking part in the discussions.

Tell them of the magnificent library which has been brought together under the direction of our Librarian, Mr. E. C. Jones, and which books are at the disposal of all members for the asking. Show them the advantages to be gained by their being in attendance upon our conventions, and if for no other purpose than to get in contact with the men who are the upbuilders of our industry from an executive point of view, as well as from a manufacturing and commercial standpoint.

These are a few of the reasons why all persons engaged in our industry should be members of the Pacific Coast Gas Association. Can we not have your assistance in this small matter? In anticipation of your effort, I am enclosing application blank for such purpose. Let us have at least 500 strong to welcome our colleagues in 1915. Do it now. You will hear further from us as to our 22d Convention, which is to be a bumper. Yours very truly,

Henry Bosworth, Secretary.

BRIEFLY TOLD.

Missouri Commission Regulations.—The Public Service Commission of Missouri has published its rules specifiying standards of service for utility companies. All utilities operating in the State, including those owned by municipalities, are subject to the regulations, which include a uniform system of accounting. Meters must be installed without charge, and tested upon request; and when reading meters there must be left on the premises of the consumer a card indicating when the meter was read and what it showed. This card must be destroyed when the reader visits the house the next month. Utility companies will be required to pay 6 per cent. interest on deposits demanded as a guaranty for the payment of monthly bills, and the amount of the deposits is limited to an estimated two months' bill.

No utility under the order can discontinue the service to any patron for alleged violation of its rules without giving such consumer twenty-four hours' notice, and stating particularly how he is delinquent. Companies furnishing gas and water are required to own the connecting pipe from the gas or water main to the curb of the street or alley. Companies are required to keep a complete record of all meters showing the date of purchase, record of use, nature and date of all tests, adjustments and repairs to which the meter has been subjected. The reason for making all tests must be stated and the accuracy of the meter set forth. If an electric meter, a statement regarding "creepage" must be made. Those not required to maintain testing equipment may make the tests by using the standard equipment of the nearest company required to maintain it. Bills rendered must be made so clear that the average consumer may readily understand them. For the payment of $2 a patron dissatisfied with the performance of the meter may have it tested by the Public Service Commission. Gas furnished by utilities must show an average monthly standard of 600 B.T.U. and the minimum shall never be less than 550. Pressure of gas in the mains shall not be less than 2 inches or more than 6 inches water pressure at the outlet of the service to any consumer. An accurate record must be kept of all gas manufactured or passed into the mains for distribution and this shall always be open to inspection by the Commission. Gas meters showing an error of measurement in excess of 2 per cent. when passing gas at the rate of 6 cubic feet per hour must be removed. Companies must test gas meters free upon demand, unless they have been tested within twelve months. No electric meter shall be placed in service or kept there which, upon test shows an error in measurement in excess of 4 per

cent. at the specified test load. No meter shall be adjusted to record more than 2 per cent. fast at any of the test loads. A hearing is announced for July 28 to listen to criticisms on the rules and they will be in effect as of August 1st.

PHILADELPHIA SECTION GAS "METERS."—On June 24th the Philadelphia Gas Meeters held their final meeting for the year. A splendid dinner was served at 6:30 o'clock in the dining room of the Bingham Hotel, attended by more than 100 men, including some 35 visiting lighting experts connected with the Welsbach Company, who were specially invited. The dinner was followed by a cabaret show. After the festivities a business meeting was held to hear the report of the Secretary-Treasurer, Mr. H. E. Stiteler, and to elect three Commissioners and a Secretary-Treasurer for the coming year. Messrs. H. P. Bartlett, Charles Ehrenzeller and S. J. Franklin were elected Commissioners, and Mr. Bartlett appointed Chairman. Mr. R. H. Predmore was elected to succed Mr. Stiteler. A rousing vote of thanks was extended to the retiring officers for their year's effective work. After the balloting Mr. Will W. Barnes, of New York, former Grand Commissioner, announced that Mr. L. R. Dutton had been elected Grand Commissioner, and Mr. Stiteler had been elected to the office of General Secretary.

BRONX GAS AND ELECTRIC COMPANY EMPLOYEES' ASSOCIATION.—The monthly meeting of the Bronx Gas and Electric Company Employees' Association was held on July 8th in the reading room, and considering the hot weather and thinned ranks due to vacations, a good number attended. The first business of the evening was the planning of the annual outing to be held at Valley Grove on August 2d. Mr. Ferdon, Office Manager, has proved himself a master in arranging such affairs, and if past outings are a criterion, a large number will be on hand at that date to enjoy the beautiful sail up the Sound. The balance of the evening was given over to Mr. Rushmore's very interesting illustrated lecture on "The Electrification of the Panama Canal." The lecture was read by Mr. W. A. Root, Commercial Manager, and Mr. Spillane ably handled the lantern. Following the lecture, all enjoyed a buffet lunch and adjournment was taken until September 9th.

NEW ENGLAND SECTION NATIONAL COMMERCIAL GAS ASSOCIATION.—The annual outing of the New England Section, N. C. G. A., was at the Villa Napoli, Nantasket Beach, Saturday, June 27th. 150 members gathered for the beautiful sail down the harbor, and upon landing at Nantasket Beach were met by "Al" Vegkley, who was there with the glad hand to welcome his many friends. The committee on sports, consisting of Arthur Leary, Jos. Joyce and E. E. Onell, Jr., having prepared numerous athletic events, started the ball rolling at 3:30, with a game between a picked nine of gas men and a nine of the Certified Accountants Association. The gas men had the better of the game up to the 6th inning, but it finally resulted in a 15 to 7 victory for the Accountants' team. The field sports embraced a potato race, won by Mr. Standivin, with Mr. Wade second; a 100-yards dash, won by Binon, and Standivin second; broad jump, won by Kelly and Carr second; 3-legged race, won by Kelley and Binon, with Burney and Duckfield second. All of the winners were from the Old Colony Gas Company, Weymouth, Mass., and were evidently well trained for the occasion by their chief, George Smith, Jr. At the close of the athletic events, the line of march was taken to the banquet hall, and the dinner was a decided success. All enjoyed themselves, singing the latest popular ballads, accompanied by a 5-piece orchestra.

MUTUAL LIABILITY INSURANCE IN NEW YORK.—Gas and electric companies in New York have organized a mutual liability insurance company under the compulsory Workingmen's Compensation Law now in force and, although unique in the public service business, the enterprise bids fair to be highly successful. The Company, the Utilities Mutual Insurance Company, commenced business on July 1st with sixty-nine policies written, covering about 5,000 employees, and while its organization is a direct result of the enactment of the Workingmen's Compensation Law, it was possible largely on account of the Empire State Gas and Electric Association which has brought about such friendly relations between the various companies in the State and a strong sentiment for co-operative effort.

The New York Law requires insurance of employees against injuries, but provides four ways in which it may be cared for. First, is the State Fund, with rates for insurance set at a little over 8 per cent. less than the rates which may be charged by stock or mutual companies; next are the stock companies; third, the mutual companies with minimum rates which may be charged by stock and mutual companies fixed by the State; fourth, self-insurance under restrictions prescribed by the State. Each of the four methods has its advantages, and there was very full discussion pro and con among the companies before it was decided that as matters stood, in this State at least, the plan of a mutual company held out prospects of greatest benefits. The reasons which led to this conclusion are interesting and instructive. After all is said, the real object to be attained both from a humanitarian and financial standpoint is a reduction in the number of accidents. With this object in mind it appeared that the mutual plan would be the most effective and economical, as it would be of direct interest to each member, not only to reduce his own accidents, but also to see that the other members used care to reduce theirs. The standards for construction and operation which will have to be established can best be prepared by men who, through long experience, are familiar with conditions and who know the practical end of the business. In the acceptance or rejection of risks the judgment of a board of directors composed of the executives of public service companies who have a personal acquaintance with the applicant's conditions should be of very great benefit. Another weighty argument was that a mutual insurance compang with the members bound together by financial interests, would aid and strengthen the co-operative spirit in the Empire State Gas and Electric Association and tend to make its work in all lines even more effective. Every year it is more evident to progressive public service men that what is beneficial to the industry generally is also beneficial in the long run to the individual companies even though something else may at the moment seem preferable. Taking this broad view, a number of the larger companies, while able to carry their own insurance and, for some reason preferring to do so, decided that a mutual company of the kind organized would be for the best interests of the industry in the State; and they have, therefore, placed their insurance with the Company, and have been very active in the preliminary work which was necessary.

The company's by-laws provide for at least 13 directors, 11 of whom must be policy-holders. Each policy-holder is a member of the company and has one vote, with one additional vote for each 500 employees; but in no case can a member have more than 20 votes. The State fixes the minimum rates which may be charged for each class of risk, and the percentage of premiums which may be devoted to operating and administrative expenses. As a precautionary measure the directors have fixed the rates at 10 per cent. higher than the minimum set by the State. The State Department rules that operating and administrative expenses of mutual companies shall not exceed 3½ per cent. of the premiums. A "Catastrophe Surplus" must be set aside at the rate of 10 per cent. of the premiums until it amounts to $100,000, and thereafter at the rate of 5 per cent., until it shall in amount comply with the provisions of the law. Profits accumulated after paying all losses and expenses and setting aside the necessary reserves, are to be returned to the members in the form of dividends. It is also provided, as a further measure of safety, that a "Certificate Holders Surplus Fund" shall be set up to provide a secondary defense against catastrophe. At the end of each year a certificate will be given to each member setting forth his interest in this fund, and while the fund belongs to holders of the certificates, the company reserves the right to draw upon it under certain extraordinary circumstances which are clearly specified in the by-laws.

The company will promulgate and may modify from time to time, standards for construction and for methods of operating with a view to reducing the number of accidents. It will circulate among its members information in regard to accidents which occur, so that precautionary measures may be taken to prevent their repetition. It will employ a corps of inspectors to visit the plants of all members and applicants for membership. A merit rating system will be employed, which will give added incentive to the members to bring their plants and systems up to standard and to maintain a high state of efficiency in their accident prevention work.

Of the 69 members on July 1st, 45 are electric companies, 7 artificial gas companies, 10 combined gas and electric companies, and 7 natural gas companies. The officers are: President, J. T. Hutchings, General Manager of the Rochester Railway and Light Company; Vice-President, J. C. DeLong, President Syracuse Lighting Company; Secretary and Treasurer, C. H. B. Chapin, Secretary Empire State Gas and Electric Association. The General Agents are Parsons & Co., and the company's headquarters are at 51 Wall Street, New York city.

DEATH OF MR. J. E. J. MAYER.—The many friends of Mr. J. E. J. Mayer, Manager of the Commercial Department, Peoples Gas Light and Coke Co., Chicago, will be shocked to hear of his sudden death on Friday the 10th inst. His death was due to heart failure superinduced by attack of acute indigestion. Mr. Mayer was born in Natchez, Miss., in 1863. He had a hight school education, and after various business connections accepted a clerical position with the old Mutual Company in Chicago prior to the time of that company's merger in the Peoples Gas Light and Coke Company. After the consolidation Mr. Mayer continued in the employ of the larger company, and in the course of time was transferred from the accounting department to the street department. Then he was advanced to the position of Purchasing Agent, and in September, 1911, was made Manager of the Commercial Department, which position he filled with great success until his death. Mr. Mayer's loss will be deeply felt by his business associates and friends.

The Analysis and Classification of Illumination Systems.

[From Report of the Research Committee, Illuminating Engineering Society.]

The subject is considered chiefly from the standpoint of laboratory analysis, having in mind the physical factors which should be considered by the physiological and psychological investigator of lighting problems. Into what fundamental factors can an illumination system be resolved for study, and how shall these be measured and recorded in order that the exact working conditions may be understood or duplicated?

The scientific analysis of a lighting system is completely given by a record of the intrinsic brilliancies of all objects visible from the position chosen for test, and by the components of illumination at all points. For complete description of the lighting conditions the number of measurements would be very large, but in any case, by attention to the more significant points and the exercise of judgment, the number may be greatly reduced. Also, while every factor is actually given by this data, a more concrete idea may often be obtained from more obvious characteristics, such as the general direction of the light, the area of the principal light source, whether it is visible or invisable to the observer, and in other cases by commercial specifications.

Intrinsic Brilliancy (or candle-power per unit of area).—A complete plot of the intrinsic brilliancies of all visible areas constitutes a picture of the image thrown upon the retina. In many cases this gives all the necessary information. These measurements should be plotted upon a dimensioned drawing, or better, upon a photographic print. All points cannot, of course, be so given, but special attention should be paid to the extremes; to the bright light sources and their backgrounds; to adjacent spaces of greatly different brightness. The method of making contour maps by the surveyor might be taken as a guide to what is called for here.

Components of Illumination.—The number of components of illumination at a point is infinite, and the number of points or planes upon which measurement can be made is infinite. In any given case the points or planes of chief interest must be selected and the illumination components determined in the smallest number of directions which will give an adequate idea of conditions. Thus in much illuminating engineering work the horizontal plane, 30 inches (6.76 m.) above the floor is chosen for measurement, as being desk and table height; but other planes often figure, as in library lighting, where the plane of the bookcase is of chief interest. The number of components to be measured is determined by the kind of test or work. If the test involve only flat surfaces, such as print, the measurement of intrinsic brilliancy or of normal illumination is sufficent. If relief surfaces, such as type, then the direction of light becomes significant. In any case the greatest number of components likely to be of interest at the point of work is 9, namely, vertical, 4 at 45°, 4 horizontal.

Other factors actually covered by these measurements, but capable of supplying significant information immediately, are as follows:

Visibility of Light Sources.—The illumination of the floor and lower part of the room by daylight is frequently from a part of the sky not visible to the occupants of the room. The illumination of the working plane may be entirely unaffected by the interposition of a shade between the light source and the observer, but the visibility or invisibility of the illuminant is of interest to the worker. Consequently the concealment or visibility of the light source is a significant factor and is easily recorded. By "light sources" must be understood, in illumination science, not alone the original illuminant, such as the flame or filament, but the surface from which the light comes, either by emission, diffuse reflection or diffuse transmission. Thus the bright ceiling used with an "indirect" unit is the light source to be considered in discussing visibility or concealment, not the lamp in the fixture. The terms "primary light source" and "secondary light source" may be used if desired to distinguish between the original illuminant, and the reflecting and transmitting accesories which also illuminate the point of study.

Area of Light Source.—The character of the shadows and the relative value of different components of illumination is conditioned largely by the angle subtended by the principal light source. The statement that the light sources are practically points (as in the case of bare incandescent lamps) or areas of several square meters (when a bright ceiling is used) is of value.

Direction of Light.—Usually the light falling on the working plane comes largely from a definite direction, above or from one side. Since certain details are revealed by one direction of light over another, this is a factor of importance. Esthetic values are affected to a marked degree by the direction of shadows, and as a consequence the general impression produced depends on the direction of light.

Dimensions and Commercial Specifications.—No details of dimensions or position which are necessary for the complete picturing of conditions should be omitted. The use of commercial specifications of illuminants, auxiliary apparatus and illuminated surfaces frequently save much time, but it must not be forgotten that such specifications are apt to be of significance only locally and for a limited time. The legitimate use of photographs with dimensions to show details of shape and position, and on which measurements of surface brightness are marked to show brightness distribution, is to be encouraged.

The suggestion is made that investigations of lighting conditions from the standpoint of physiology and psychology, the study of methods of tests for effects upon the eye, etc., should be initially made upon the simple component factors which in combination produce all the retinal images presented by illuminated spaces. The study of the effects of observing different surface brightness, of different areas, in various positions, presenting various contrasts in brightness with their surroundings and at different distances from the observer will, if consistently planned, furnish the information from which the effects of complex lighting installation may be determined (by proper test method). Information founded upon this analysis should point the way to improve methods of lighting. As an assistance to the work of representing results on photographic prints, the study of photographic processes with a view of developing a set of specifications as to processes and materials so as to render possible faithful and useful photographs is recommended.

So called "direct" and "indirect" lighting were next discussed and the opinion developed that these terms properly described lighting "units" rather than lighting "systems."

For describing systems, these terms are incomplete and not based on the significant factors; the area and intrinsic brilliancy of the light source, its visibility or concealment and the general direction of the light flux received on the working plane. Two lighting systems exactly the same as regards directional values, intensity, etc., might in one case be direct and the other an indirect system. Cases would arise where direct lighting is accomplished by indirect or semi-indirect fixtures. Weight must be given to the fact that the really significant features, such as softness of shadows, concealment of illuminants, etc., characteristic of one so-called "system" may readily be copied by another system. It, therefore, appears to this committee inadvisable to attach the terms "direct" and "indirect" to systems of illumination, but rather to lend its weight to the application of those terms merely to the units.

As a basis for definitions of "direct," "indirect" and "semi-indirect" *lighting units*, the committee suggests the following:

Direct Unit.—A lighting device from which over half the emitted light flux is directed downward, or to the side, reaching the surface to be illuminated without being reflected by the walls or ceiling.

Semi-Indirect Unit.—A lighting device employing a diffusing or translucent medium to direct most of the light to the walls or ceiling to be redirected for use, a part of the light being diffused through this medium.

Indirect Unit.—A lighting device from which all the light emitted is projected to the ceilings or walls and then reflected to the object to be lighted.

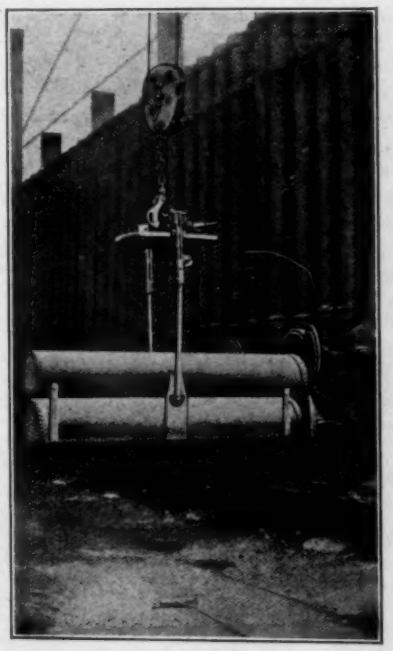
These definitions will not cover all possible types which may be developed. It must not be forgotten that the only complete specification of a lighting unit is by its candle power distribution curve, its dimensions, intrinsic brilliancy, etc. The same unit may be direct or indirect, depending upon whether it is turned up or down, so that these definitions are strictly of the *unit as used*.

A CURIOUS fire is reported from Emaus, Pa., during an electrical storm, a bolt of lightning entered the residence of Dr. Lichtenwalner on South Fifth street. The bolt passed along the gas pipe to the waiting room of his office, where the pipe was broken and the gas escaping was at once ignited. The gas flames shot up to the ceiling, but were soon extinguished and the gas turned off in the cellar. No other damage was done anywhere in the house, and it is a mystery as to where the bolt entered.

The "Dryco" Coke Cooling System.

In the Liverpool (England) Gas works the coke is quenched without direct contact with water. The system called the "Dryco" made under patents granted to Messrs. Allen and Gibson is described in the Journal of Gas Lighting (London).

A steel container (consisting of two parallel vessels, one above the other, of the same section as the retorts to be discharged, each half the length of the retort) is suspended from an overhead telpher or transporter. The container is brought into position in front of the retort in a horizontal position. Its open end is placed against the open retort, and half of the charge of coke pushed into the container by the discharging machine. The container is then raised and the other half similarly filled. It then swings into a vertical position, and a lid automatically and quickly closes the end of the container. It is then transported by the telpher, lowered into a water tank, and detached. The coke being in a closed water tight vessel, neither water nor air have access to it during the period of cooling. In about three-quarters of an hour the coke is cooled; the container is then lifted by the telpher, taken to the coke store and discharged.



"Dryco" Container in Position before the Retort Bench, ready for Filling.

In the interval between the placing of the container in the tank and its removal to the coke store, the telpher has filled, transported and immersed several other containers, going through the cycle of operations: (1) Filling with coke. (2) Cooling in tank. (3) Discharging in coke store. It is estimated that to ensure a rapid service, one container is required for about every nine retorts of 20 feet length. In smaller works this can be reduced.

By means of the "Dryco" system the coke is absolutely dry, very large, almost free from breeze, and of a bright silvery gray color. It commands a higher price for household and industrial use than ordinary wet coke, through its greater heating value, and has been used for foundry work with encouraging results. It is suitable for many purposes for which the more expensive furnace and foundry cokes are now employed. The cost of handling is low; and as the coke is quickly removed in closed vessels, there is practically no flame, smoke, steam, or dust. By extending the overhead telpher track, the coke can be discharged on to a coke heap, into hoppers (with or without a breaker or screen), or direct into railway trucks or carts.

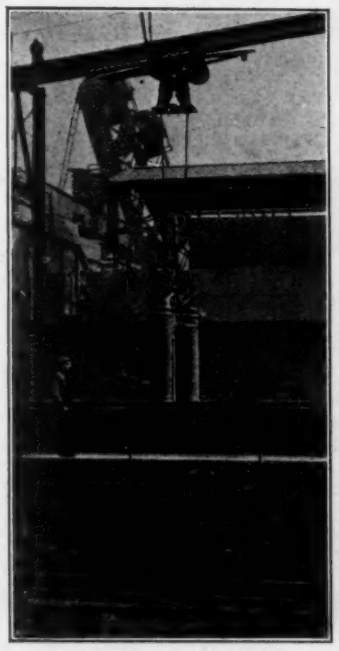
The following are the advantages claimed to be obtained by producing "Dryco" instead of gas coke:

1. *Satisfaction of Customers.*—This is owing to the improved quality and higher calorific value. The higher calorific value is mainly due to the absence of moisture, and is about 13,000 B.T.U. per pound, varying with the class of coal used. The effect of 10 per cent. of moisture in the fuel may be seen from the following calculations:

	B.T.U.
Heating power of 90 pounds. of dry fuel at 13,000 B.T.U. per pound	1,170,000
Heating power of 10 pounds water	....
Heat required to evaporate the 10 lbs. of water	11,180
Actual heating power of 100 lbs. of moist fuel.	1,158,820
Actual heating power of 100 lbs. of "Dryco"	1,300,000
Gain in heating power by using "Dryco"	141,180

Equals 12.19 per cent.

2. *Better Price Obtained.*—From the above it will be seen that the calorific value of gas coke containing 10 per cent. of moisture, compared with "Dryco," is as 100 to 112.19. There is also the better



"Dryco" Container being Lowered into the Cooling Tank.

"Dryco" Container Automatically Discharging.

value due to the physical conditions of the coke, its better burning qualities, and the saving in carriage. "Dryco" coke burns quietly, and does not crackle or fly when placed on an open fire. It contains very little "small" or dust, as by this process breakage by conveying machinery and repeated falls is reduced to a minimum, while disintegration and softening through the application of water and steam are entirely avoided. It is harder and larger in size than ordinary gas coke.

3. *Economy in Working Costs.*—By the adoption of the "Dryco" system, considerable saving is effected. There is practically no breeze produced, screening is unnecessary, and "quenching" is done automatically. The economy will be seen from the following figures:

	Old System. Per Ton.	"Dryco" System. Per Ton.
Loss due to breeze (say) 10 per cent. —0.10 ton at 2.25	22.5	....
Cost of screening (including power and labor and maintenance, also depreciation) per ton	6.3	....
Water for quenching (this charge is for circulating the cooling water in the "Dryco" system and for the water thrown over the coke in the old system)	2.0	2.0
Total cents	30.8	2.0

This saving is to a small extent discounted by the fact that under the old system the buyer pays for moisture at the price of coke. The comparison given shows that "Dryco" could be sold at a less price than gas coke, and still yield a better return, though, being of great value, a higher price might easily be obtained.

4. *Saving on Carriage.*—As one ton of "Dryco" is of much higher value as a fuel than ordinary gas coke it naturally follows it will cost less in carriage for equal heating value.

5. *Quality is Uniform.*—As "Dryco" contains no moisture, and is not damaged in manufacture, it is more uniform in quality than ordinary coke, which is known to vary very considerably in the amount of water it contains and in its physical condition.

6. *No Choking of Drains by Coke Dust.*—The water used in cooling does not come in contact with the coke, and is as clean after using as before.

7. *Conservation of the Heat.*—The heat in the "Dryco" is transferred to the cooling water; and the latter may be used for boiler feeding, producers, or any other purpose for which warm water is required.

8. *Flame, Smoke, Steam and Dust avoided in the Retort-House.*—As the "Dryco" is removed in closed vessels, the clouds of steam, smoke, coke-dust and flame, as well as the intense heat, always asso-

ciated with the open system of quenching by water, are all avoided. The system (which is fully protected by patents in England and abroad) can be applied to either large or small works with satisfactory results; and a "Dryco" plant is capable of extension at any time without interfering with existing plant.

Gas Purification by Heat.

[From a lecture by DR. CHARLES CARPENTER, Chairman of the South Metropolitan Gas Company, London.]

The first proposal for purifying gas from sulphur was made by Edward Heard, in 1806, whose object was to produce gas that could be burned without an offensive smell, and there was a record of the manufacture of his apparatus, or something like it, at Dudley in 1818. Later, Lowe had a similar apparatus, and Samuel Parker used an arrangement of horizontal iron pipes heated in a furnace. The Palmer process was referred to in Peckston's work in 1819, and in 1842 the Athenaeum Library reported that the damage to the books was occasioned by the excessive sulphur contained in the products of gas combustion.

In 1851 the Act was passed appointing a chemist to test the gas supplied, and under these powers Thompson issued several reports, in which he stated that the gas was overcharged with bi-sulphide of carbon, and that it was highly desirable that some means should be taken to ensure better manufacture. Thompson carried out experiments which was stated to have resulted in success in the elimination of the bi-sulphide, but for some years the matter appeared to be dormant It was revived in 1868 by Bowditch, who delivered a discourse to directors and managers of gas works, in which he described a process of his own for purifying gas. He claimed that it would secure the desired result without interfering with the dividends, arguing that as it would only involve an outlay of 2 cents per 1,000 cubic feet, which consumers would be glad to pay to be rid of the sulphur, and that it would bring about increased consumption; but nothing came of his process. In 1883 the so called "Cooper" process of mixing lime with coal before carbonizing, was tried at the Vauxhall Works of the South Metropolitan Gas Company, but it was discontinued for various reasons, among them being disappointment at the absence of substantial gain in ammonia, which was an important claim of the patentee. Numerous other schemes have been brought forward, one of the most successful that of Hall and Papst, a process laid down in the works of the Portland Gas Company, Portland, Ore. The only criticism he had to make regarding the working of this plant was that as the fire was internal, each re-heater had to be operated intermittently instead of continuously, which meant that its gaseous contents had to be changed before and after each run. It works at a very high temperature, at 704° C. a reduction of 79 per cent. is obtained. Considering the methods of purification by means of catalytic substances, Dr. Carpenter described experiments made over a period of years at the works of his company. Among the materials which had been used as catalysts were nickel, platinum, iron oxide, pumice, glass balls, and other substances, and the results secured by these were shown by diagram. The best results were with nickel, which produced purification at a lower temperature than platinum, and considerably lower than the other metals named. The apparatus which gave the best results was described and illustrated. After experimenting exhaustively with the various materials, it was determined to use as the catalyst, pumice impregnated with a nickel salt, and a plant was erected at the Old Kent Road capable of dealing with 1½ million cubic feet per day. The results were so satisfactory that a plant has been erected at the East Greenwich works to handle 15,000,000 cubic feet a day. It consisted of 5 units, each heated by a producer supplying gas to a combustion chamber. The combustion chamber is divided from the two heating chambers by a perforated wall which permits a convenient flow in either direction, through the catalytic tubes. After passing through these it goes through two heating chambers, in the second of which it loses heat, it being necessary to lower the temperature of the gas before it entered the oxide purifier for the final purification. All the time that the gas is flowing through the two heating chambers and out by the main outlet, gas is also passing through the apparatus in the reverse direction, into the heating plant and then into the catalytic tubes. The brickwork is thick at the bottom and on the sides, to keep the heat in as much as possible, and the bottom is in two feet of sand.

The gas is pre-heated at about 400° C., and the reaction takes place at 450° C. The total weight of nickel in the plant is 1,320 pounds, and the plant consumes 5½ tons of coke per day. After the plant had worked for about 30 days, its efficiency went off, and it was necessary to burn off the carbon from the catalyst. For the secondary systems of purification they used a simple system of four boxes in rotation and two catch boxes. The reason for the second purification was that, although the gas was free from sulphuretted hydrogen when it entered the plant, it contains a high per cent. when it leaves.

The 1½ million plant has been in operation for two years, and has treated 400 million cubic feet of gas. He had one of the 6-inch tubes so that it might be examined by those interested. There was a slight internal corrosion and the outside of the tube exposed to the heat of the furnace was practically in the same condition as when it was put up. He had also for inspection some of the catalytic material—small balls of fire clay, impregnated with nickel chloride. So far there is no reduction in the efficiency of the balls; they were efficient as catalysts as when they first began. In burning off the carbon they first passed chimney gases through the plant, the object being to purge from the plant the whole of the residual coal gas. Then they turned on the air very carefully and gradually, otherwise the extremely intense combustion of the finely divided carbon would melt the tubes. They knew when all the carbon was burnt out, but assuming that there was somewhere a red-hot patch of carbon they passed chimney gases through the apparatus in order to make quite sure of sweeping out all the air. Then they turned on the coal gas again, and the plant continued its work as before. To illustrate the efficiency of the apparatus the following statistics were given:

Working Results, Old Kent Road Plant, 24th January, 1913, to 31st May, 1914.

Gas Treated. Cubic Feet.	Sulphur Grains Per 100 Cu. Ft. Before Treatment.	After Treatment.	Percentage. Reduction.
2,335,766,000.....	39.74	8.22	79.3

Eastern Greenwich Plant, April and May, 1914.

483,888,000.....	35.07	7.82	77.7

Effect Produced on Gas of High and Low Sulphur Content.

	Sulphur Grains Per 100 Cu. Ft. Before Treatment.	After Treatment.	Percentage. Reduction.
Maximum	63.78	10.34	83.8
Minimum	19.21	5.34	73.2

The Quality of Gas Before and After Catalytic Treatment.

	Before Treatment.	After Treatment.
Illuminating power—candles....	14.7	14.7
Calorific power gross B.T.U.....	590.0	594.4
Naphthaline grains per 100 cu. ft.	5.54	4.71
Hydrocyanic acid.....	22.19	18.57
Analysis: CO_2 per cent. by volume	1.44	1.45
CnHm.....	3.55	3.63
O_2.....	0.33	0.06
CO.....	8.16	8.03
CH_4	26.85	27.26
H_2	54.19	54.25
N_2 (by difference).....	5.48	5.22

Cost of Process.

	Cents Per 1,000 Cu. Ft.
Fuel (coke at $3.75 a ton).....	0.198
Conveying coke, clinkering furnaces and aerating catalytic material.....	0.116
Power.....	0.006
Supervision and testing.....	0.022
Repair and maintenance.....	0.060
Depreciation—10 per cent. on capital cost..	0.196
Total per 1,000 cubic feet.....	0.598

Remembering the disfavor with which some of the old engineers looked upon the process with regard to illuminating power they took one of the retort houses making 2 million feet per day, and worked with loads so light that they made 20-candle power gas from Newcastle coal, and found that while the average quality of the gas was 20.54, after treating it was 20.54, and that for 20 odd candle power there was no loss in illuminating power. He mentioned an experi-

ment carried out with an iron retort, single ended, and standard Durham coal. They found on a production of 7,900 cubic feet per ton with an illuminating power of 24 c.p., the sulphur contents with inside purification were 19.56 grains per 100 cubic feet. The weight of the charge was about 7 cwt. for 24 hours. When the temperature was increased so as to give 10,942 cubic feet., the illuminating power fell to 18 21, and the sulphur contents rose to 29.96. They made a further test, using a fireclay retort with higher temperature, and got 13,219 cubic feet per ton, and the illuminating power fell to 15.65, and the sulphur contents rose to 53.28 grains. From this it would be seen that the quantity of sulphur contents in the days of the iron retorts must have been comparatively low, and he was inclined to think that in striving after higher yields engineers had lost sight of the no less important factor, the quality of the gas produced. Experiments at Sunderland with vertical retorts gave 22.31 grains per 100 cubic feet, which was about one half of what would have been obtained with the same coal had it been carbonized in horizontals. Then they applied to the output of the vertical retorts the sulphur reduction plant on a small scale, and they were able to bring it down to 5.93, practically a reduction of 73 per cent. There was no doubt that if the application had been on a large scale plant the sulphur content would have come down to something like 4 or 5 grains.

He left to the last what was in many respects the most interesting of all processes which had been proposed for purification by heat—the suggestions of M. Gier in a paper read to the Société Technique de l'Industrie du Gaz en France. His process was that the reaction should take place in the presence of water vapor, and instead of the carbon being thrown out as solid carbon it came out as carbonic acid. This reaction, which was hardly preceptible when iron was not present, and at ordinary temperatures, assumed greater importance and technical rapidity when the temperature was raised. It was necessary that the sulphate should be continually eliminated, and an admirable material for this was oxide of iron. The gas was already saturated with water vapor as it came from the entrance and it was only necessary to use a purifier containing heated oxide of iron. A sulphur content in unpurified gas of 18 grains per 100 cubic feet had been reduced by this treatment to 4.3. The temperature of the reaction was as low as 130° C., whereas in the case of the South Metropolitan Company they worked at between 400° and 450°. The process was a very promising one and they would look forward to the results obtained by it.

What were the lessons to be drawn from the century's teaching? Over and over again chemists had told the gas industry not only that lighting gas might be free from the bi-sulphide impurity, but how it was to be done. If one tenth of the time devoted to the perfecting of the retort settings had been given to the purification by heat, would the industry stand where it is to-day? Was it not probable that they would have been spared the lamentations of the gas works's manager who wrote to the press recently bewailing his lost lighting load? Engineers have too long concentrated on dividend making in the retort house to the neglect of dividend losing by the inadequacy of the purifying. Gas undertakings, in their own interests, if in no other, must take out the sulphur impurity. The South Metropolitan discovered this. They had triumphed over the difficulty by unrestricted collaboration of the engineer and the chemist. If their industry is to prosper, as it could, and must, chemistry must be its hand maiden and not a divorcee. More and more each day it needed a chemist at its right hand guiding it in its counsels, probing difficulties and pointing out pitfalls. Neither must respect the other less because the one thinks in grains and the other in tons, for their respective mental visions were in nearly every case of a different character and always would be. If these lessons are taken to heart the end of its second century will find the industry to which we are all so deeply attached in a stronger and more impregnable position even than it is to-day.

L. P. Lowe, President of the Economic Gas Company (Los Angeles. Cal.), has arranged to appear before the City Council to make an argument in behalf of an ordinance prohibiting the gas and electric companies in Los Angeles from granting any special favors to their consumers. During the hearing on the gas rate some time ago it developed that the gas companies, and particularly the Los Angeles Gas and Electric corporation, were offering inducements to consumers in competitive territory to use their gas in preference to that of other companies. The Economic company objected at the time on the ground that this tended to destroy competitive conditions.

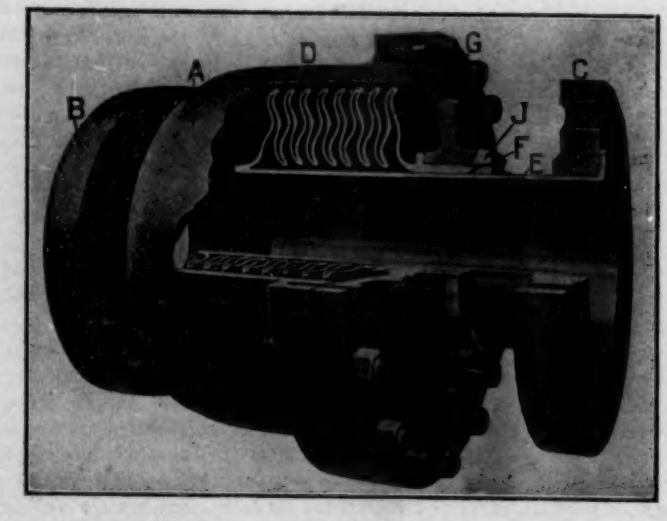
New Methods and Appliances.

Liquid Air and Oxygen.—Liquid air was first produced by Cailletet in 1877, and the world's output now amounts to 3,532 cubic feet per hour. The process of manufacture consists essentially in allowing air to cool (after compression) by its own expansion, and using this air in turn to cool other air which is still to undergo expansion, and so on until liquefaction takes place. The cheap production of oxygen from liquid air has given an impetus to this new industry. The fact that nitrogen solidifies at 211° C. while oxygen remains liquid, allows of the latter being drawn off. The cost of oxygen obtained in this manner is said to be about 20 francs per ton. Many interesting applications of oxygen might be mentioned. Thick armor plate is readily cut through by first heating the metal and directing on to the surface a fine jet of cold oxygen. By the addition of oxygen to the blast in a 100-ton blast furnace of the Ougree works in Belgium a saving of 60 kg. in the coke necessary for smelting 1 ton of iron has been obtained, and the output was increased 10 to 15 per cent. In conjunction with a special form of lampblack, liquid oxygen produces an explosive equal to dynamite and at about half the cost. Small bags of this lampblack are dipped into liquid oxygen and become highly explosive by detonation. In the event of a misfire any chance of accident is avoided by waiting a short time, when the oxygen will have evaporated.

Preservation of Wood.—Wood should be seasoned for at least 6 to 12 months before treatment. (1) *Kyanizing* consists in steeping timber in a 1 per cent. solution of mercury chloride for 7 to 11 days. (2) *Burnettizing* comprises preliminary steaming, followed by impregnation in a 2½ to 2 per cent. solution of zinc chloride under a pressure of 7 to 8 atmospheres. In the *zinc-tannin* or *Wellhouse* process, treatment in a partial vacuum follows the preliminary steaming, a small percentage of glue is added to the zinc chloride, and after impregnation from 2½ to 6 hours at 100 to 125 pounds pressure per square inch, the timber receives a final treatment with a 0.5 per cent. solution of tannin under the same pressure for two hours. (3) *Creosoting* usually involves steaming of the dried timber, heating under reduced pressure, and treatment with creosote oil under a pressure of 100 to 180 pounds per square inch. The amount of creosote absorbed by the timber varies from 7 to 20 pounds per cubic foot, and the temperature of the treatment should be between 100° and 130° C. In the *Curtis-Isaacs* process, the timber and creosote are heated to above the boiling point of the sap at ordinary pressure in a retort having vents open to the air; the vents are then closed and the creosote is forced into the wood under pressure. The *Rueping* process consists in forcing, first, air at a pressure of 80 to 100 pounds per square inch into the pores of the wood, and then at a higher pressure creosote oil, without relieving the air pressure. In the *Lowry* process treatment with creosote oil at 77° to 82° C. under a pressure of 180 lbs. per square inch is followed by draining and a rapid vacuum treatment. In the *zinc-creosote* or *Rutger* process an emulsion of ½ pound of "dry zinc" and 1.5 to 4 pounds of creosote oil per cubic foot of timber is used; the emulsion being continuously agitated by a centrifugal pump. The *Hasselmann* process uses a solution containing copper, aluminum and potassium sulphates, heated to 118° to 126° C. under a pressure of 35 pounds per square inch. In the *creoresinate* process (especially suitable for wood paving blocks) air at 121° C., under a pressure of about 100 pounds per square inch, is substituted for steam; the antiseptic agent consists of 50 parts of creosote oil, 48 of resin, and 2 of formaldehpde, and impregnation is followed by a treatment with lime water at 100° C. under 150 pounds pressure. The *Guissani* process uses a mixture of anthracene and pitch heated to 140° C., in which wood is submerged until it is free from moisture and sap, after which it is successively treated with cold, heavy tar oil, and cold zinc chloride solution. In the *saccharine solution* or *Powellizing* process, suitable for the treatment of green wood, a solution consisting mainly of sugar, with a small percentage of arsenic, is used. The *Vulcanizing* or *Haskinizing* process consists in roasting wood, which has been previously dried by steaming, to a temperature high enough to coagulate its dried albumins (71° to 94° C.), and to resolve some of the fibre and sap with the production of wood creosote. In addition to the use of definite antiseptics and of a large number of metallic salts for wood preservation, mineral oils, preferably mixed with asphaltum can be used to fill up the open wood

cells, thus protecting the timber from the action of heat, moisture, and air. By the zinc chloride process the life of wood is more than doubled; creoseted wood lasts 25 to 50 per cent. longer than wood treated with zinc chloride, but costs three or four times as much. The amount of preservative injected into one cubic foot of various classes of timber ranges from about 3 pounds of mercury chloride in the hard woods, to about 6 pounds for moderately hard woods and 10 pounds for soft woods, the corresponding amounts of creosote oil being 3, 10, and 20 pounds respectively. The average costs of preserving timber with zinc chloride, creosote oil, and mercury chloride are approximately 2.5 cents, 10 cents, and 16 cents a cubic foot respectively.

HIGH PRESSURE EXPANSION JOINT.—The high pressure steel expansion joint illustrated herewith is being placed on the marked by a New York company. In this joint use is made of a nest of circular



disks stamped from steel plates of high elastic limit, welded together to form a flexible bellows, which absorbes the movement of the pipe line. As shown in the illustration, one end of the nest is welded to the steel tube *E*, and the other end to the sleeve *F*, the latter held in place by the locknut *J*. Leakage between the sleeve *F* and casing head *G* and the casing *A* is prevented by special gaskets. Only the outside of the bellows is under steam pressure, and therefore no condensation can collect within the disks. The working portion of the joint is protected from outside injury by the cast iron casing *A* and the casing head *G*, which are designed to withstand pressures up to 200 pounds per square inch. To safeguard the expansion joint against excessive movement, the flang *C* will strike the locknut *J* when the maximum lineal movement for which the joint is designed is reached.

Recent Patent Issues.

Prepared for the AMERICAN GAS LIGHT JOURNAL by ROYAL E. BURNHAM, solicitor of patents and counselor in patent causes, 833 Bond Building, Washington, D. C., from whom illustrations and specifications of any patent mentioned below may be obtained for 20 cents.

1,101,537. Gas and Vapor Burner. C. A. Haas, St. Louis, Mo.

1,101,787. Apparatus for Regulating the Air Supply of Gas Producers. H. L. Doherty, New York city.

1,101,788. Method of Conducting Combustion. H. L. Doherty, New York city.

1,101,789. Method of Burning Liquid Fuels. H. L. Doherty, New York city.

1,101,790. Process of Burning Liquid Fuels. H. L. Doherty, New York city.

1,101,863. Incandescent Gas Lamp. T. J. Litle, Jr., Woodbury, N. J., assignor to Welsbach Light Co., Gloucester City, N. J.

1,102,592. Bell for Gas Lights. J. D. Kantro, New York city.

1,102,723. Intergrating and Recording Apparatus for Meters. F. N. Connet, Providence, R. I., assignor to Builders' Iron Foundry, Same place.

1,102,751. Gas Burner. J. Hicks, Calgary, Alberta, Canada.

Items of Interest
FROM VARIOUS LOCALITIES.

THE Jacksonville (Fla.) Gas Company has announced a voluntary reduction in its gas rate, the seventh annual lowering of price by that company. The net price for domestic purposes is now $1.15 per thousand while 7 years ago it was $1.50. To-day Jacksonville enjoys a rate on gas lower than any other Southern city of the same size and population, and, in addition to the rate, enjoys a service that is almost unequalled for its excellence. As the cost of production lowered and the demand grew greater the Jacksonville Gas Company lowered the rate and increased the service, until to-day there is hardly a section of the city or its adjacent suburbs where the mains of this gas company do not thread the streets, and where the convenient fuel is not used.

THE unseasonable weather has had a favorable effect on the output of the Boston Consolidated Gas Company, the cold and rain resulting in the largest increase in gas consumption in two years. In the 7 days ended July 6, the gas output showed an increase of 19.8 per cent. compared with the corresponding period a year ago. The gas subsidiaries of the Massachusetts Gas Companies, in East Boston, Quincy and Newton also showed large increases in output.

THE Attleboro (Mass.) Gas Light Company has forwarded to the Selectmen its reply to the proposal at the recent hearing that the company investigate and decide whether it would build an extension to Dodgeville. Petitioners in that village asked the Selectmen to force an extension and threatened to start a gas company of their own as an alternative. The company in its reply says that the extension would cost $13,085, and that the guarantee income would be only $245. It asserts that an income of $2,093 would be required and denied the request for an extension.

THREATENING skies could not spoil the fun of the employees of the Springfield (Mass) Gas Light Company at their annual clambake at Riverside Park last week, and the 130 men and women who were there testified to a good time by punishing several barrels of clams, a whole battalion of lobsters and a like number of chickens. The party left the city at 1.30 o'clock, and arriving at the park a program of sports was the order of things. Three events were arranged for the women. The first, a 50-yard dash, was won by Miss May Otto; the potato race was won by Miss Mary Garner. The third was a naildriving contest, and Mrs. F. L. Belcher was awarded the prize. A silk umbrella, a box of candy and a nice new hammer were the prizes. A fine briar pipe went to Mr. Bradway in a ball throwing contest for accuracy, and a pipe and package of tobacco was the reward of Howard King for winning shoe race. By winning the running broad jump Jack Collins won a bottle of beer, which incidently was the only "wet goods" at the bake, but sad to relate, Mr. Collins is an earnest temperance worker, so the prize was not appreciated. A package of cereal was the reward given to John Huson for putting the shot farther than his competitors. The last event was a tug-of-war between teams captained by Charles Blood and William St. Germain. Mr. Blood's team won and each member was awarded a fine leather belt. An added feature to the program was a baseball game in 5 chapters, between teams representing the executive and meter departments, which was won by the inkslingers by the loopsided score of 10 to 1. The feature of the game was the umpiring of "Sid" Mullens, who nearly lost his life in an attempt to render impartial decisions. Benjamin P. Bill was master of ceremonies and everyone had a "bully" good time.

THE Ypsilanti (Mich.) city fathers have designated July 27th as the day for holding the special election on the proposal to acquire the present plant of the Ypsilanti Gas Company for $110,000 and $20,000 for fixtures and supplies. Registration will be July 18.

AT a meeting of the stockholders and directors of the Twin State Gas and Electric Company held in New York, W. G. Meloon was elected Treasurer and Ivan L. Meloon President, the latter for the seventh consecutive term. The Twin State Company owns the electric light and gas plants in Bennington and Brattleboro, Vt., Hoosick Falls, N. Y., and Berlin, Gorham, Dover, Rochester and Somersworth, N. H.

It is reported from Harrisburg, Pa., that coke oven gas from Steelton is to be piped to Harrisburg and distributed there. Mains now being laid between Steelton and Highspire are said to be part of the trans-mission line that will bring the gas from the ovens of the Pennsylvania Steel Company.

The Commercial Township Committee has given notice that a contract is about to be made with the Millville (N. J.) Gas Company to light the township roads with gas for a period of five years.

On the subject of by-product oven gas for Chattanooga, Tenn., an officer of the Chattanooga Gas Company is quoted as saying: "We will go half way and do our part toward co-operating with the Durham Coal and Iron Company, but our own interests must first be safeguarded; then we will do all that is reasonable to encourage establishment and co-operate to assist in making the ovens profitable to their owners.

The settlement of Mannford, Okla., is agitating the question of issuing bonds to build a municipal water works and gas plant.

The United Gas and Electric Corporation, of New York, has just purchased the electric light plant of the Conestoga (Pa.) Electric Company, which supplies light and power to New Holland, Blue Bell, Earl and East Earl townships. The price paid was $31,000.

The gas plant at Lehighton, Pa., promoted and erected by John McDermott of Allentown, was put in operation a few days ago. The plant will furnish gas to Lehighton, Weissport and Parryville, through 7 miles of mains. Half of the capital invested was furnished by Allentonians. The opening work was satisfactory to all concerned.

Herman H. Alers, for 40 years an employe of the Providence Gas Company, died at his home in East Providence, R. I., where he had lived for 35 years. Mr. Alers retired about two years ago owing to failing health and he has gradually declined since that time. His death, however, was unexpected and came rather suddenly. He was born in Providence and was the son of John G. and Mary Carpenter Alers. When a boy he went to California with his father, who was interested in gold mining, and stayed in that State for 14 years. He returned to East Providence and soon after entered the employ of the Providence Gas Company, where he was an inspector for many years. He married Harriet Jane Dodge of East Providence, who survives him, as do twin sons, Albert E. S. and Oliver H. G. Alers, both of East Providence.

The gas plant at Waterville, Me., is now in successful operation, starting with 70 consumers on about 8 miles of mains. It is proposed to extend to several near-by villages. Mr. L. L. Cadwallader, formerly of Chambersburg, Pa., is in charge of the company and its operation.

City Solicitor Ryan, of Philadelphia, has notified Director Cooke that the United Gas Improvement Company and Northern Liberties Gas Company cannot be required to furnish gas gratuitously to the city for heating purposes. The bureau of city property desired to establish gas radiators in the guard houses in the parks for the comfort of guards in winter, but Mr. Ryan contends that gas may be obtained free from the companies only for illumination.

The Brockton (Mass.) Gas Light Company are changing their prepayment meters in Holbrook from $1.25 to $1.20 a 1,000 feet. When the gas was first installed the rate was $1.25, but the Company agreed that on July 1, 1914, they would reduce it to $1.20. The Company is more than satisfied with the manner in which the citizens are installing the gas in their residences for lighting and domestic purposes.

Incorporation has been authorized of the Statesville Gas Light and Fuel Company, of Statesville, N. C., with a capital of $125,000. The incorporators are G. M. Bridgman, Philadelphia, Pa.; F. D. Moses, Trenton, N. J.; H. P. Grier, Statesville, N. C., and H. H. Greenfield, Bridgeport, Conn.

Because of the failure of the finance committee to find $5,000 asked for by the Gas Consumers' League for the purpose of making an investigation of the affairs of the Atlanta, (Ga.) Gas Light Company, Alderman I. N. Ragsdale has offered a resolution in council urging the appointment of a special committee to confer with the Company with a view of getting a voluntary reduction. A petition signed by 1,500 voters was presented to council in June asking that an appropriation of $5,000 be made in the fight the Gas Consuners' League is making for an 80-cent gas rate. The petition was referred to the finance committee, but on account of the stringent condition of the city finances the money could not be spared.

The Roanoke (Va.) Gas Company gave its annual picnic to Coyner's Spring last week. Several motor trucks were employed in taking the party to the scene of activity. After an elaborate and much enjoyed lunch, a base ball game was played between the Gas Company nine and a team representing the Virginia Bridge and Iron Company in which the sturdy sluggers of the gas company defeated their formidable opponents. The game was featured by a home run and good all-around playing. Members of the picnic gathering expressed themselves as having a splendid time at the Springs and look forward to another one next year.

At the annual meeting of the stockholders of the Milwaukee Gas Light Company the incumbent officers were re elected. They are: President, Allanson P. Lathrop of New York; Vice President, Sheldon J. Glass, of Milwaukee; Secretary and Treasurer, Ewald Haase of Milwaukee; General Manager, R. B. Brown of Milwaukee; Chairman of the Board of Directors, Emerson McMillin of New York. The following are the Board of Directors: A. P. Lathrop, S. J. Glass, E. McMillin, Nelson P. Hulet, Fred W. Rogers, O. C. Fuller, A. K. Hamilton, E. J. Lindsay and H. August Luedke. Following the usual custom, the directors voted to grant the employees of the company a bonus of 10 per cent. on the wages earned during the last half year.

The Kinston (N. C.) City Council is preparing to hire an expert engineer to take charge of the extensive municipal improvements to be made within the coming six months. One hundred thousand dollars worth of bonds will be advertised for sale within the next week, and as soon as the sale has been negotiated work will be started on sewerage, lighting and paving extensions, much of which will be in East Kinston, where most of the cotton mill population is located. In public improvements, the town will easily lead all others in Eastern Carolina during the last half of 1914. The Southern Gas Improvement Company will install a plant to cost about $100,000. Work on this and about 12 miles of mains will be commenced early in the fall.

The Boone (Ia.) Gas Company has just made two very important announcements, one that the price of gas had been reduced; and the other is that the plant is to receive some elaborate improvements, including new machinery. The new price is $1.30 gross and $1.20 net per thousand, and the new construction is to include considerable main extensions and the beginning of a belt line booster, besides enlarged manufacturing facilities.

The Chamber of Commerce, of Spokane, Wash., has been advised by the Spokane Gas and Fuel Company, that the Doherty Operating Company will open a co-operative compaign with the industrial committees of the commercial clubs in the cities in which the Doherty plants are located; to act as clearing house for the interchange of information as to factory prospects, and to help their industrial development.

A joint application has been filed with the Ohio Utilities Commission by the Youngstown Consolidated Gas and Electric Company and the Youngstown and Sharon Street Railway Company, asking for the approval of the Commission in the purchase of the property and franchise of the Gas and Electric Company by the Street Railway Company. The reason for the amalgamation is given as due to the fact that all the stock of both companies is owned by the Mahoning and Shenango Railway and Light Company, and the two petitioners desire to combine in order to simplify the corporate organization. The capital stock of the Youngstown Consolidated Gas and Electric Company is given as $1,035.000. That of the Street Railway Company as $712,500.

Mr. Roger W. Polk, until recently with the Laclede-Christy Clay Products Company, has opened an office as Consulting Gas Engineer at 193 Washington Avenue, Providence, R. I.

Utilities Commission News.

PACIFIC GAS AND ELECTRIC PLAN APPROVED.—The Railroad Commission of California has formally approved the new financial plan of the Pacific Gas and Electric Company. The Commission's order dated July 1, 1914, provides as follows:

"That the Company issue when it desires $5,000,000 general and refunding bonds now pledged under the Company's issue of 1-year notes maturing March 25, 1915; that $5,000,000 general lien 6 per cent. bonds also pledged under notes shall, upon payment of notes, be canceled; that Company may issue and sell $12,500,000 face value of its newly created first preferred 6 per cent. stock at not less than $82.50 per share; that the Company may exchange its old issue of $10,000,000 preferred stock for new preferred stock after July 1, 1916, at the rate of 10 shares of old for 10½ shares of new. The proceeds of the $5,000,000 general and refunding bonds and $12,500,000 first preferred stock are to be applied to the extent of $7,000,000 to retire 1-year notes, $4,586,661 for reimbursement of the Company's treasury for advances for construction, and the balance utilized for future needs."

A DRASTIC REDUCTION.—The Missouri Public Service Commission has ordered a reduction of 37 per cent. in the rates for electric light by the Springfield Gas & Electric Company. In making the reduction the Commission held that 7 per cent. should be considered a reasonable return on the capital investment of the Company, and also that the properties of the gas and electric company had been overvalued as reported for purposes of the rate investigation. This is the first rate case decided by the Missouri Commission, and it is probable that the reduction order, as well as that regarding the valuation of the properties, will be carried to the courts by the company.

WATCHING BROOKLYN, N. Y. CASE.—The suit against the Directors of the Brooklyn Union Gas Company by Thomas Read, in the Supreme Court, is to be watched closely by the 1st District Public Service Commission. At present, however, the Commission has no reason for interfering in the matter. Mr. Read charges extravagance and mismanagement against the officials of the Company, and asserts on behalf of a committee of stockholders, that millions of profits have been concealed from the Commission in order to prevent it making an order for the reduction in the price of gas. The Commission is not concerned in the method of distribution of such profits as are earned, but it is interested in the total amount of profits realized, and if it be shown that the profits earned amount to an excessive percentage, the Commission would entertain a complaint looking to a reduc- in the price charged for gas.

EXTEND MASSACHUSETTS BOARD'S AUTHORITY.—All Massachusetts hydro-electric companies, after August 1, will be under the jurisdiction of the State Gas and Electric Commission, by force of the "consolidated law," recently enacted. After that date all new issues of securities by these companies will require the approval of that Commission. The new law does not provide against the ownership of such utilities by voluntary associations, to which class belongs the recently formed New England Company, which controls the New England Power-Connecticut River Companies, and which has sold $1,800,000 5 per cent bonds of a proposed issue of $30,000,000.

REDUCTION REFUSED.—The up state New York Public Service Commission has refused at this time to order the Nassau and Suffolk Lighting Company to reduce its charge of $1.50 a 1,000 cubic feet in Rockville Center, L. I., on the complaint of the Board of Trustees of that village. The Commission finds that evidence submitted by the Company showing a relative great length of mains to volume of gas sold in the sparsley settled territory which it serves, proves the net revenue from this service not to warrant a reduction in rates. The complainants submitted evidence to show that neighboring communities get gas from the Company cheaper than it is sold in Rockville, but as the Company declares its intention voluntarily to equalize its rates throughout its territory so that none of the rates will be over $1.40, the Commission closes the complaint on its books with the privilege to the complainant of reopening it on or after May 1, 1915.

Financial Notes.

IN a petition filed in the Superior Court against the Macon Gas Company and the officers and directors of the Georgia Light, Power and Railway Company, an injunction is asked to prevent the defendants from proceeding with their intention to increase the capital stock of the company from $300,000 to $700,000; to keep them from exercising the powers of officials of the company and their election be declared null and void, and from further acting under agreements whereby the control of the Macon Gas Company shall be in the same persons as control other public utilities known as the A. B. Leach properties. The petitioners also ask that a receiver be appointed to take charge of the stock of the Macon Gas Company, and, if unable to get hold of it, that he take over the franchises and all physical properties of the company; that the contract and agreement under which the Georgia Light, Power and Railway Company owns the stock of the Macon Gas Company be declared illegal, the defendants being perpetually enjoined in the future from owning any stock in the Macon Gas Company. The suit is the result of the action of the gas company in endeavoring to increase its capital stock, the petitioners owning 10 shares of stock in the company. They claim that to increase the stock will seriously injure their holdings, which, they say, they cannot now sell to any one but the Georgia Light, Power and Railway Company, and that at a price fixed by that company.

THE Lincoln (Neb.) Gas and Electric Light Company has asked leave of the State Railway Commission to issue $500,000 of 3-year 6 per cent. notes to pay off 6 per cent. notes due August 1. The company says it now has outstanding $2,250,000 of common stock and there is a mortgage securing an issue of $333,000 6 per cent. mortgage bonds, and a mortgage on the company's entire property securing an issue of $1,500,000 of 5 per cent. first consolidated mortgage bonds due December 1, 1914, of which bonds there is in the hands of the public $767,000. and in the hands of a trustee $333,000, and $400,000 pledged as collateral to the notes issued under date of July, 12, 1911. The company says in its application that the bond market has been bad and it has been unable to sell its bonds, and the only arrangement it has been able to make for paying the notes is to issue other 3-year notes. No dividends have been paid since the Commission issued its order of July 12, 1911. It has outstanding $40,000 of floating short time indebtedness. The company asks for a continuation of that part of the order issued in 1911, authorizing it to sell certain preferred stock, and permission for the sale of $500,000 of notes at not less than 95 cents; to enable the company to pay outstanding notes, bills payable, acquisition of property and improvement of facilities.

SUBSIDIARIES of American Gas and Electric Company, continue to report good gains in their earnings, although the rate of increase is somewhat lower than it was at this period last year, owing to the depressed condition of general business. Of the thirteen operating subsidiaries of the Company five, located at Canton, O., Marion, Ind., Rockford, Ills., Scranton, Pa. and Wheeling, W. Va., have reported earnings for May, 1914. Consolidated earnings of the properties for May show a gain of $30,059 in gross, $7,702 in net and of $1,748 in surplus after charges. For the twelve months ended May 31, 1914, consolidated gross earnings of these subsidiaries were $2,580,567, an increase of $415,547 over the preceding twelve months with $1,388,890 net, an increase of $251,573, and consolidated surplus of $901,894, a gain of $166,639. American Gas and Electric Company recently authorized the issue of 6 per cent. debenture bonds, dated May 1, 1914, and due May 1, 2014, under an open debenture, and $1,000,000 of these debentures have been issued and are being sold at 97½ and interest. The debentures are in $100, $500 and $1,000 denominations and may also be issued in sterling in case it is found desirable to make a market abroad for them.

COLUMBIA Gas and Electric Company is taking up in cash at par the outstanding dividend scrip certificates of Union Gas and Electric Company. This scrip to the amount of $375,000 was issued July 1, 1909, in payment of 16 months deferred dividends on the preferred stock of the Union Gas and Electric, the money which would have gone for dividends being used for repairs and betterments on the Company's plants. Last fall an offer to exchange debenture bonds of Columbia Gas and Electric for the dividend scrip was made and about $275,000 was so exchanged. The remaining scrip is now being paid off in cash at maturity.